Package ‘sparklyr’

September 2, 2023

Type Package

Title R Interface to Apache Spark

Version 1.8.3

Maintainer Edgar Ruiz <edgar@rstudio.com>

Description R interface to Apache Spark, a fast and general engine for big data processing, see <https://spark.apache.org/>. This package supports connecting to local and remote Apache Spark clusters, provides a 'dplyr' compatible back-end, and provides an interface to Spark's built-in machine learning algorithms.

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URL https://spark.rstudio.com/

BugReports https://github.com/sparklyr/sparklyr/issues

Depends R (>= 3.2)

Imports base64enc, config (>= 0.2), DBI (>= 1.0.0), dbplyr (>= 2.2.1), digest, dplyr (>= 1.0.9), ellipsis (>= 0.1.0), generics, globals, glue, httr (>= 1.2.1), jsonlite (>= 1.4), methods, openssl (>= 0.8), purrr, rappdirs, rlang (>= 0.1.4), rstudioapi (>= 0.10), tibble, tidy (>= 1.2.0), tidyselect, uuid, vctrs, withr, xml2

Suggests arrow (>= 0.17.0), broom, diffobj, foreach, ggplot2, iterators, janeaustenr, Lahman, mlbench, nnet, nycflights13, R6, r2d3, RCurl, reshape2, shiny (>= 1.0.1), parsnip, testthat, rprojroot

Encoding UTF-8

RoxygenNote 7.2.3

SystemRequirements Spark: 1.6.x, 2.x, or 3.x

R topics documented:

'tidiers_ml_multilayer_perceptron.R' 'tidiers_ml_naive_bayes.R'
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'tidy_unnest.R' 'worker_apply.R' 'worker_connect.R'
'worker_connection.R' 'worker_invoke.R' 'worker_log.R'
'worker_main.R' 'yarn_cluster.R' 'yarn_config.R' 'yarn_ui.R'
'zzz.R'

NeedsCompilation no

Author Javier Luraschi [aut],
   Kevin Kuo [aut] (<https://orcid.org/0000-0001-7803-7901>),
   Kevin Ushey [aut],
   JJ Allaire [aut],
   Samuel Macedo [ctb],
   Hossein Falaki [aut],
   Lu Wang [aut],
   Andy Zhang [aut],
   Yitao Li [aut] (<https://orcid.org/0000-0002-1261-905X>),
   Jozef Hajnala [ctb],
   Maciej Szymkiewicz [ctb] (<https://orcid.org/0000-0003-1469-9396>),
   Wil Davis [ctb],
   Edgar Ruiz [aut, cre],
   RStudio [cph],
   The Apache Software Foundation [aut, cph]

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checkpoint_directory

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| checkpoint_directory | Set/Get Spark checkpoint directory |

Description

Set/Get Spark checkpoint directory

Usage

spark_set_checkpoint_dir(sc, dir)

spark_get_checkpoint_dir(sc)

Arguments

sc A spark_connection.
dir checkpoint directory, must be HDFS path of running on cluster

collect_from_rds Collect Spark data serialized in RDS format into R

Description

Deserialize Spark data that is serialized using ‘spark_write_rds()’ into a R dataframe.

Usage

collect_from_rds(path)

Arguments

path Path to a local RDS file that is produced by ‘spark_write_rds()’ (RDS files stored in HDFS will need to be downloaded to local filesystem first (e.g., by running ‘hadoop fs -copyToLocal ...’ or similar)

See Also

Other Spark serialization routines: spark_insert_table(), spark_load_table(), spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(), spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(), spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(), spark_write_avro(), spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(), spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
**connection_config**

**Description**

Read configuration values for a connection.

**Usage**

```
connection_config(sc, prefix, not_prefix = list())
```

**Arguments**

- `sc` : spark_connection
- `prefix` : Prefix to read parameters for (e.g. `spark.context`, `spark.sql`, etc.)
- `not_prefix` : Prefix to not include.

**Value**

Named list of config parameters (note that if a prefix was specified then the names will not include the prefix)

---

**compile_package_jars**  
*Compile Scala sources into a Java Archive (jar)*

**Description**

Compile the `scala` source files contained within an `R` package into a Java Archive (jar) file that can be loaded and used within a Spark environment.

**Usage**

```
compile_package_jars(..., spec = NULL)
```

**Arguments**

- `...` : Optional compilation specifications, as generated by `spark_compilation_spec`. When no arguments are passed, `spark_default_compilation_spec` is used instead.
- `spec` : An optional list of compilation specifications. When set, this option takes precedence over arguments passed to `...`.

---
**Description**

Copy an R data.frame to Spark, and return a reference to the generated Spark DataFrame as a tbl_spark. The returned object will act as a dplyr-compatible interface to the underlying Spark table.

**Usage**

```r
## S3 method for class 'spark_connection'
copy_to(
  dest,
  df,
  name = spark_table_name(substitute(df)),
  overwrite = FALSE,
  memory = TRUE,
  repartition = 0L,
  ...
)
```

**Arguments**

- `dest` A spark_connection.
- `df` An R data.frame.
- `name` The name to assign to the copied table in Spark.
- `overwrite` Boolean; overwrite a pre-existing table with the name name if one already exists?
- `memory` Boolean; should the table be cached into memory?
- `repartition` The number of partitions to use when distributing the table across the Spark cluster. The default (0) can be used to avoid partitioning.
- `...` Optional arguments; currently unused.

**Value**

A tbl_spark, representing a dplyr-compatible interface to a Spark DataFrame.

---

**distinct**

*Distinct*

**Description**

See `distinct` for more details.
download_scalac  Downloads default Scala Compilers

Description

compile_package_jars requires several versions of the scala compiler to work, this is to match Spark scala versions. To help setup your environment, this function will download the required compilers under the default search path.

Usage

download_scalac(dest_path = NULL)

Arguments

dest_path  The destination path where scalac will be downloaded to.

Details

See find_scalac for a list of paths searched and used by this function to install the required compilers.

dplyr_hof  dplyr wrappers for Apache Spark higher order functions

Description

These methods implement dplyr grammars for Apache Spark higher order functions

ensure  Enforce Specific Structure for R Objects

Description

These routines are useful when preparing to pass objects to a Spark routine, as it is often necessary to ensure certain parameters are scalar integers, or scalar doubles, and so on.

Arguments

object  An R object.
allow.na  Are NA values permitted for this object?
allow.null  Are NULL values permitted for this object?
default  If object is NULL, what value should be used in its place? If default is specified, allow.null is ignored (and assumed to be TRUE).
Description

See fill for more details.

filter

Description

See filter for more details.

find_scalac

Description

Find the scalac compiler for a particular version of scala, by scanning some common directories containing scala installations.

Usage

find_scalac(version, locations = NULL)

Arguments

version
The scala version to search for. Versions of the form major.minor will be matched against the scalac installation with version major.minor.patch; if multiple compilers are discovered the most recent one will be used.

locations
Additional locations to scan. By default, the directories /opt/scala and /usr/local/scala will be scanned.
ft_binarizer

Feature Transformation – Binarizer (Transformer)

Description

Apply thresholding to a column, such that values less than or equal to the threshold are assigned the value 0.0, and values greater than the threshold are assigned the value 1.0. Column output is numeric for compatibility with other modeling functions.

Usage

ft_binarizer(
    x,
    input_col,
    output_col,
    threshold = 0,
    uid = random_string("binarizer_"),
    ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
input_col The name of the input column.
output_col The name of the output column.
threshold Threshold used to binarize continuous features.
uid A character string used to uniquely identify the feature transformer.
... Optional arguments; currently unused.

Value

The object returned depends on the class of x.

• spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark
See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`

Examples

```r
## Not run:
library(dplyr)

sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

iris_tbl %>%
  ft_binarizer(
    input_col = "Sepal_Length",
    output_col = "Sepal_Length_bin",
    threshold = 5
  ) %>%
  select(Sepal_Length, Sepal_Length_bin, Species)
## End(Not run)
```

### ft_bucketizer

**Feature Transformation – Bucketizer (Transformer)**

**Description**

Similar to R’s `cut` function, this transforms a numeric column into a discretized column, with breaks specified through the `splits` parameter.

**Usage**

```r
ft_bucketizer(
  x,
  input_col = NULL,
  output_col = NULL,
  splits = NULL,
  input_cols = NULL,
  output_cols = NULL,
)```
ft_bucketizer

splits_array = NULL,
handle_invalid = "error",
uid = random_string("bucketizer_"),
...

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
input_col The name of the input column.
output_col The name of the output column.
splits A numeric vector of cutpoints, indicating the bucket boundaries.
input_cols Names of input columns.
output_cols Names of output columns.
splits_array Parameter for specifying multiple splits parameters. Each element in this array can be used to map continuous features into buckets.
handle_invalid (Spark 2.1.0+) Param for how to handle invalid entries. Options are 'skip' (filter out rows with invalid values), 'error' (throw an error), or 'keep' (keep invalid values in a special additional bucket). Default: "error"
uid A character string used to uniquely identify the feature transformer.
... Optional arguments; currently unused.

Value

The object returned depends on the class of x.

• spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh(), ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
## ft_chisq_selector

### Feature Transformation – ChiSqSelector (Estimator)

#### Description
Chi-Squared feature selection, which selects categorical features to use for predicting a categorical label

#### Usage
```r
ft_chisq_selector(
  x,
  features_col = "features",
  output_col = NULL,
  label_col = "label",
  selector_type = "numTopFeatures",
  fdr = 0.05,
  fpr = 0.05,
  fwe = 0.05,
  num_top_features = 50,
  percentile = 0.1,
  uid = random_string("chisq_selector_"),
  ...
)
```

#### Arguments
- `x`: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `features_col`: The column name for the features.
- `output_col`: The output column name for the transformed data.
- `label_col`: The column name for the label.
- `selector_type`: The type of selection. Possible values are `numTopFeatures`, `topKFeatures`, `thresholdFeatures`, and `percentileFeatures`.
- `fdr`: False discovery rate.
- `fpr`: False positive rate.
- `fwe`: False discovery error.
- `num_top_features`: The number of top features to select.
- `percentile`: The percentile to select.
- `uid`: A unique identifier for the selection process.

### Examples
```r
## Not run:
library(dplyr)

sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

iris_tbl %>%
  ft_bucketizer(
    input_col = "Sepal_Length",
    output_col = "Sepal_Length_bucket",
    splits = c(0, 4.5, 5, 8)
  ) %>%
  select(Sepal_Length, Sepal_Length_bucket, Species)

## End(Not run)
```
features_col  Features column name, as a length-one character vector. The column should
be single vector column of numeric values. Usually this column is output by
*ft_r_formula*.

output_col  The name of the output column.

label_col  Label column name. The column should be a numeric column. Usually this
column is output by *ft_r_formula*.

selector_type  (Spark 2.1.0+) The selector type of the ChisqSelector. Supported options: "numTopFeatures" (default), "percentile", "fpr", "fdr", "fwe".

fdr  (Spark 2.2.0+) The upper bound of the expected false discovery rate. Only applicable when selector_type = "fdr". Default value is 0.05.

fpr  (Spark 2.1.0+) The highest p-value for features to be kept. Only applicable when selector_type = "fpr". Default value is 0.05.

fwe  (Spark 2.2.0+) The upper bound of the expected family-wise error rate. Only applicable when selector_type = "fwe". Default value is 0.05.

num_top_features  Number of features that selector will select, ordered by ascending p-value. If the number of features is less than num_top_features, then this will select all features. Only applicable when selector_type = "numTopFeatures". The default value of num_top_features is 50.

percentile  (Spark 2.1.0+) Percentile of features that selector will select, ordered by statistics value descending. Only applicable when selector_type = "percentile". Default value is 0.1.

uid  A character string used to uniquely identify the feature transformer.

...  Optional arguments; currently unused.

Details

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is then immediately used to transform x, returning a tbl_spark.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

- tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark.
See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()

-----

**ft_count_vectorizer**  
*Feature Transformation – CountVectorizer (Estimator)*

**Description**

Extracts a vocabulary from document collections.

**Usage**

```r
ft_count_vectorizer(
  x,
  input_col = NULL,
  output_col = NULL,
  binary = FALSE,
  min_df = 1,
  min_tf = 1,
  vocab_size = 2^18,
  uid = random_string("count_vectorizer_"),
  ...
)

ml_vocabulary(model)
```

**Arguments**

- **x**  
  A spark_connection, ml_pipeline, or a tbl_spark.

- **input_col**  
  The name of the input column.

- **output_col**  
  The name of the output column.

- **binary**  
  Binary toggle to control the output vector values. If TRUE, all nonzero counts (after min_tf filter applied) are set to 1. This is useful for discrete probabilistic models that model binary events rather than integer counts. Default: FALSE
min_df
Specifications the minimum number of different documents a term must appear in to be included in the vocabulary. If this is an integer greater than or equal to 1, this specifies the number of documents the term must appear in; if this is a double in [0,1), then this specifies the fraction of documents. Default: 1.

min_tf
Filter to ignore rare words in a document. For each document, terms with frequency/count less than the given threshold are ignored. If this is an integer greater than or equal to 1, then this specifies a count (of times the term must appear in the document); if this is a double in [0,1), then this specifies a fraction (out of the document’s token count). Default: 1.

vocab_size
Build a vocabulary that only considers the top vocab_size terms ordered by term frequency across the corpus. Default: $2^{18}$.

uid
A character string used to uniquely identify the feature transformer.

... Optional arguments; currently unused.

model
A ml_count_vectorizer_model.

Details

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is then immediately used to transform x, returning a tbl_spark.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

ml_vocabulary() returns a vector of vocabulary built.

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
**ft_dct**

*Feature Transformation – Discrete Cosine Transform (DCT) (Transformer)*

### Description

A feature transformer that takes the 1D discrete cosine transform of a real vector. No zero padding is performed on the input vector. It returns a real vector of the same length representing the DCT. The return vector is scaled such that the transform matrix is unitary (aka scaled DCT-II).

### Usage

```r
ft_dct(
  x,
  input_col = NULL,
  output_col = NULL,
  inverse = FALSE,
  uid = random_string("dct_"),
  ...
)
```

```r
ft_discrete_cosine_transform(
  x,
  input_col,
  output_col,
  inverse = FALSE,
  uid = random_string("dct_"),
  ...
)
```

### Arguments

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **inverse**: Indicates whether to perform the inverse DCT (TRUE) or forward DCT (FALSE).
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

### Details

`ft_discrete_cosine_transform()` is an alias for `ft_dct` for backwards compatibility.
ft_elementwise_product

Feature Transformation – ElementwiseProduct (Transformer)

Description

Outputs the Hadamard product (i.e., the element-wise product) of each input vector with a provided "weight" vector. In other words, it scales each column of the dataset by a scalar multiplier.

Usage

```r
ft_elementwise_product(
  x,
  input_col = NULL,
  output_col = NULL,
  scaling_vec = NULL,
  uid = random_string("elementwise_product_"),
  ...)
```
Arguments

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **scaling_vec**: The vector to multiply with input vectors.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Value

The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

- **ml_pipeline**: When `x` is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

- **tbl_spark**: When `x` is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark.

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh(), ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
Usage

```r
ft_feature_hasher(
  x,
  input_cols = NULL,
  output_col = NULL,
  num_features = 2^18,
  categorical_cols = NULL,
  uid = random_string("feature_hasher_"),
  ...
)
```

Arguments

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **input_cols**: Names of input columns.
- **output_col**: Name of output column.
- **num_features**: Number of features. Defaults to $2^{18}$.
- **categorical_cols**: Numeric columns to treat as categorical features. By default only string and boolean columns are treated as categorical, so this param can be used to explicitly specify the numerical columns to treat as categorical.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Details

Feature hashing projects a set of categorical or numerical features into a feature vector of specified dimension (typically substantially smaller than that of the original feature space). This is done using the hashing trick [https://en.wikipedia.org/wiki/Feature_hashing](https://en.wikipedia.org/wiki/Feature_hashing) to map features to indices in the feature vector.

The FeatureHasher transformer operates on multiple columns. Each column may contain either numeric or categorical features. Behavior and handling of column data types is as follows:

- **Numeric columns**: For numeric features, the hash value of the column name is used to map the feature value to its index in the feature vector. By default, numeric features are not treated as categorical (even when they are integers). To treat them as categorical, specify the relevant columns in `categorical_cols`.
- **String columns**: For categorical features, the hash value of the string "column_name=value" is used to map to the vector index, with an indicator value of 1.0. Thus, categorical features are "one-hot" encoded (similarly to using `OneHotEncoder` with `drop_last=False`).
- **Boolean columns**: Boolean values are treated in the same way as string columns. That is, boolean features are represented as "column_name=true" or "column_name=false", with an indicator value of 1.0.

Null (missing) values are ignored (implicitly zero in the resulting feature vector).

The hash function used here is also the MurmurHash 3 used in HashingTF. Since a simple modulo on the hashed value is used to determine the vector index, it is advisable to use a power of two as the `num_features` parameter; otherwise the features will not be mapped evenly to the vector indices.
Feature Transformation – HashingTF (Transformer)

Description
Maps a sequence of terms to their term frequencies using the hashing trick.

Usage
```r
ft_hashing_tf(
  x,
  input_col = NULL,
  output_col = NULL,
  binary = FALSE,
  num_features = 2^18,
  uid = random_string("hashing_tf_"),
  ...)
```
Arguments

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **binary**: Binary toggle to control term frequency counts. If true, all non-zero counts are set to 1. This is useful for discrete probabilistic models that model binary events rather than integer counts. (default = FALSE)
- **num_features**: Number of features. Should be greater than 0. (default = $2^{18}$)
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Value

The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When `x` is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When `x` is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_countVectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`

---

**ft_idf**  
Feature Transformation – IDF (Estimator)

### Description

Compute the Inverse Document Frequency (IDF) given a collection of documents.
ft_idf

Usage

```r
ft_idf(
  x,
  input_col = NULL,
  output_col = NULL,
  min_doc_freq = 0,
  uid = random_string("idf_"),
  ...
)
```

Arguments

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **min_doc_freq**: The minimum number of documents in which a term should appear. Default: 0
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Details

In the case where `x` is a tbl_spark, the estimator fits against `x` to obtain a transformer, which is then immediately used to transform `x`, returning a tbl_spark.

Value

The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When `x` is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When `x` is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_countVectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
Imputation estimator for completing missing values, either using the mean or the median of the columns in which the missing values are located. The input columns should be of numeric type. This function requires Spark 2.2.0+.

Usage

```r
ft_imputer(
  x,
  input_cols = NULL,
  output_cols = NULL,
  missing_value = NULL,
  strategy = "mean",
  uid = random_string("imputer_"),
  ...
)
```

Arguments

- `x`: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `input_cols`: The names of the input columns.
- `output_cols`: The names of the output columns.
- `missing_value`: The placeholder for the missing values. All occurrences of `missing_value` will be imputed. Note that null values are always treated as missing.
- `strategy`: The imputation strategy. Currently only "mean" and "median" are supported. If "mean", then replace missing values using the mean value of the feature. If "median", then replace missing values using the approximate median value of the feature. Default: mean
- `uid`: A character string used to uniquely identify the feature transformer.
- `...`: Optional arguments; currently unused.

Details

In the case where `x` is a `tbl_spark`, the estimator fits against `x` to obtain a transformer, which is then immediately used to transform `x`, returning a `tbl_spark`.

Value

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
**ft_index_to_string**

Description

A Transformer that maps a column of indices back to a new column of corresponding string values. The index-string mapping is either from the ML attributes of the input column, or from user-supplied labels (which take precedence over ML attributes). This function is the inverse of `ft_string_indexer`.

Usage

```r
ft_index_to_string(
  x,
  input_col = NULL,
  output_col = NULL,
  labels = NULL,
  uid = random_string("index_to_string_"),
  ...
)
```

Arguments

- `x` A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `input_col` The name of the input column.
- `output_col` The name of the output column.
- `labels` Optional param for array of labels specifying index-string mapping.
- `uid` A character string used to uniquely identify the feature transformer.
- `...` Optional arguments; currently unused.

**See Also**

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`
Value

The object returned depends on the class of \( x \).

- **spark_connection**: When \( x \) is a spark_connection, the function returns a \texttt{ml_transformer}, an \texttt{ml_estimator}, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

- **ml_pipeline**: When \( x \) is a \texttt{ml_pipeline}, the function returns a \texttt{ml_pipeline} with the transformer or estimator appended to the pipeline.

- **tbl_spark**: When \( x \) is a \texttt{tbl_spark}, a transformer is constructed then immediately applied to the input \texttt{tbl_spark}, returning a \texttt{tbl_spark}

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: \texttt{ft_binarizer()}, \texttt{ft_bucketizer()}, \texttt{ft_chisq_selector()}, \texttt{ft_count_vectorizer()}, \texttt{ft_dct()}, \texttt{ft_elementwise_product()}, \texttt{ft_feature_hasher()}, \texttt{ft_hashing_tf()}, \texttt{ft_idf()}, \texttt{ft_imputer()}, \texttt{ft_interaction()}, \texttt{ft_lsh}, \texttt{ft_max_abs_scaler()}, \texttt{ft_min_max_scaler()}, \texttt{ft_ngram()}, \texttt{ft_normalizer()}, \texttt{ft_one_hot_encoder_estimator()}, \texttt{ft_one_hot_encoder()}, \texttt{ft_pca()}, \texttt{ft_polynomialExpansion()}, \texttt{ft_quantile_discretizer()}, \texttt{ft_r_formula()}, \texttt{ft_regex_tokenizer()}, \texttt{ft_robust_scaler()}, \texttt{ft_sql_transformer()}, \texttt{ft_standard_scaler()}, \texttt{ft_stop_words_remover()}, \texttt{ft_string_indexer()}, \texttt{ft_tokenizer()}, \texttt{ft_vectorAssembler()}, \texttt{ft_vector_indexer()}, \texttt{ft_vector_slicer()}, \texttt{ft_word2vec()}

---

**ft_interaction**  
Feature Transformation – Interaction (Transformer)

**Description**

Implements the feature interaction transform. This transformer takes in Double and Vector type columns and outputs a flattened vector of their feature interactions. To handle interaction, we first one-hot encode any nominal features. Then, a vector of the feature cross-products is produced.

**Usage**

```r
ft_interaction(
  x,
  input_cols = NULL,
  output_col = NULL,
  uid = random_string("interaction_"),
  ...
)
```
ft_lsh

Feature Transformation – LSH (Estimator)

Description

Locality Sensitive Hashing functions for Euclidean distance (Bucketed Random Projection) and Jaccard distance (MinHash).
Usage

```
ft_bucketed_random_projection_lsh(
  x,
  input_col = NULL,
  output_col = NULL,
  bucket_length = NULL,
  num_hash_tables = 1,
  seed = NULL,
  uid = random_string("bucketed_random_projection_lsh_"),
  ...
)
```

```
ft_minhash_lsh(
  x,
  input_col = NULL,
  output_col = NULL,
  num_hash_tables = 1L,
  seed = NULL,
  uid = random_string("minhash_lsh_"),
  ...
)
```

Arguments

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **bucket_length**: The length of each hash bucket, a larger bucket lowers the false negative rate. The number of buckets will be \((\text{max L2 norm of input vectors}) / \text{bucketLength}\).
- **num_hash_tables**: Number of hash tables used in LSH OR-amplification. LSH OR-amplification can be used to reduce the false negative rate. Higher values for this param lead to a reduced false negative rate, at the expense of added computational complexity.
- **seed**: A random seed. Set this value if you need your results to be reproducible across repeated calls.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Details

In the case where `x` is a `tbl_spark`, the estimator fits against `x` to obtain a transformer, which is then immediately used to transform `x`, returning a `tbl_spark`.

Value

The object returned depends on the class of `x`. 
• spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
ft_max_abs_scaler

Arguments

- **model**: A fitted LSH model, returned by either `ft_minhash_lsh()` or `ft_bucketed_random_projection_lsh()`.
- **dataset**: The dataset to search for nearest neighbors of the key.
- **key**: Feature vector representing the item to search for.
- **num_nearest_neighbors**: The maximum number of nearest neighbors.
- **dist_col**: Output column for storing the distance between each result row and the key.
- **dataset_a**: One of the datasets to join.
- **dataset_b**: Another dataset to join.
- **threshold**: The threshold for the distance of row pairs.

---

ft_max_abs_scaler  
Feature Transformation – MaxAbsScaler (Estimator)

Description

Rescale each feature individually to range [-1, 1] by dividing through the largest maximum absolute value in each feature. It does not shift/center the data, and thus does not destroy any sparsity.

Usage

```r
ft_max_abs_scaler(
  x,
  input_col = NULL,
  output_col = NULL,
  uid = random_string("max_abs_scaler_"),
  ...
)
```

Arguments

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Details

In the case where `x` is a `tbl_spark`, the estimator fits against `x` to obtain a transformer, which is then immediately used to transform `x`, returning a `tbl_spark`. 
**ft_max_abs_scaler**

**Value**

The object returned depends on the class of \( x \).

- **spark_connection**: When \( x \) is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

- **ml_pipeline**: When \( x \) is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.

- **tbl_spark**: When \( x \) is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`.

**See Also**

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`

**Examples**

```r
## Not run:
sd <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sdc, iris, name = "iris_tbl", overwrite = TRUE)
features <- c("Sepal_Length", "Sepal_Width", "Petal_Length", "Petal_Width")

iris_tbl %>%
  ft_vector_assembler(
    input_col = features,
    output_col = "features_temp"
  ) %>%
  ft_max_abs_scaler(
    input_col = "features_temp",
    output_col = "features"
  )

## End(Not run)
```
Description

Rescale each feature individually to a common range \([\text{min}, \text{max}]\) linearly using column summary statistics, which is also known as min-max normalization or Rescaling.

Usage

\[
\text{ft\_min\_max\_scaler}(\text{x}, \text{input\_col} = \text{NULL}, \text{output\_col} = \text{NULL}, \text{min} = 0, \text{max} = 1, \text{uid} = \text{random\_string("min\_max\_scaler")}, \ldots)
\]

Arguments

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **min**: Lower bound after transformation, shared by all features. Default: 0.0
- **max**: Upper bound after transformation, shared by all features. Default: 1.0
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Details

In the case where \(x\) is a tbl_spark, the estimator fits against \(x\) to obtain a transformer, which is then immediately used to transform \(x\), returning a tbl_spark.

Value

The object returned depends on the class of \(x\).

- **spark_connection**: When \(x\) is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When \(x\) is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When \(x\) is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark.
ft_ngram

Feature Transformation – NGram (Transformer)

Description

A feature transformer that converts the input array of strings into an array of n-grams. Null values in the input array are ignored. It returns an array of n-grams where each n-gram is represented by a space-separated string of words.

Usage

ft_ngram(
  x,
  input_col = NULL,
  output_col = NULL,
)
Arguments

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **n**: Minimum n-gram length, greater than or equal to 1. Default: 2, bigram features
- **uid**: A character string used to uniquely identify the feature transformer.
- ... Optional arguments; currently unused.

Details

When the input is empty, an empty array is returned. When the input array length is less than n (number of elements per n-gram), no n-grams are returned.

Value

The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a `spark_connection`, the function returns an `ml_transformer`, an `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When `x` is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`.

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers:
- `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`,
- `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`,
- `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`,
- `ft_min_max_scaler()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`,
- `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`,
- `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`,
- `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`,
- `ft_word2vec()`
Description

Normalize a vector to have unit norm using the given p-norm.

Usage

```r
ft_normalizer(
  x,
  input_col = NULL,
  output_col = NULL,
  p = 2,
  uid = random_string("normalizer_"),
  ...)
```

Arguments

- `x`: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `input_col`: The name of the input column.
- `output_col`: The name of the output column.
- `p`: Normalization in L^p space. Must be >= 1. Defaults to 2.
- `uid`: A character string used to uniquely identify the feature transformer.
- `...`: Optional arguments; currently unused.

Value

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns an `ml_transformer`, `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- `ml_pipeline`: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.
- `tbl_spark`: When `x` is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`.

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_normalizer()`.
**ft_one_hot_encoder**  

**Feature Transformation – OneHotEncoder (Transformer)**

**Description**

One-hot encoding maps a column of label indices to a column of binary vectors, with at most a single one-value. This encoding allows algorithms which expect continuous features, such as Logistic Regression, to use categorical features. Typically, used with `ft_string_indexer()` to index a column first.

**Usage**

```r
ft_one_hot_encoder(
  x,
  input_cols = NULL,
  output_cols = NULL,
  handle_invalid = NULL,
  drop_last = TRUE,
  uid = random_string("one_hot_encoder_"),
  ...
)
```

**Arguments**

- **x**  
  A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **input_cols**  
  The name of the input columns.
- **output_cols**  
  The name of the output columns.
- **handle_invalid**  
  (Spark 2.1.0+) Param for how to handle invalid entries. Options are 'skip' (filter out rows with invalid values), 'error' (throw an error), or 'keep' (keep invalid values in a special additional bucket). Default: "error"
- **drop_last**  
  Whether to drop the last category. Defaults to `TRUE`.
- **uid**  
  A character string used to uniquely identify the feature transformer.
- **...**  
  Optional arguments; currently unused.
Value

The object returned depends on the class of \( x \).

- `spark_connection`: When \( x \) is a `spark_connection`, the function returns a `ml_transformer`, `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- `ml_pipeline`: When \( x \) is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.
- `tbl_spark`: When \( x \) is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh()`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`

---

**ft_one_hot_encoder_estimator**

*Feature Transformation – OneHotEncoderEstimator (Estimator)*

**Description**

A one-hot encoder that maps a column of category indices to a column of binary vectors, with at most a single one-value per row that indicates the input category index. For example with 5 categories, an input value of 2.0 would map to an output vector of \([0.0, 0.0, 1.0, 0.0]\). The last category is not included by default (configurable via dropLast), because it makes the vector entries sum up to one, and hence linearly dependent. So an input value of 4.0 maps to \([0.0, 0.0, 0.0, 0.0]\).

**Usage**

```r
def_one_hot_encoder_estimator(
  x,
  input_cols = NULL,
  output_cols = NULL,
  handle_invalid = "error",
  drop_last = TRUE,
  uid = random_string("one_hot_encoder_estimator_")
)
```
Arguments

- `x` A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `input_cols` Names of input columns.
- `output_cols` Names of output columns.
- `handle_invalid` (Spark 2.1.0+) Param for how to handle invalid entries. Options are 'skip' (filter out rows with invalid values), 'error' (throw an error), or 'keep' (keep invalid values in a special additional bucket). Default: "error"
- `drop_last` Whether to drop the last category. Defaults to `TRUE`.
- `uid` A character string used to uniquely identify the feature transformer.
- `...` Optional arguments; currently unused.

Details

In the case where `x` is a `tbl_spark`, the estimator fits against `x` to obtain a transformer, which is then immediately used to transform `x`, returning a `tbl_spark`.

Value

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- `ml_pipeline`: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.
- `tbl_spark`: When `x` is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`
**ft_pca**  
*Feature Transformation – PCA (Estimator)*

**Description**

PCA trains a model to project vectors to a lower dimensional space of the top k principal components.

**Usage**

```r
ft_pca(
  x,
  input_col = NULL,
  output_col = NULL,
  k = NULL,
  uid = random_string("pca_"),
  ...
)
```

```r
ml_pca(x, features = tbl_vars(x), k = length(features), pc_prefix = "PC", ...)  
```

**Arguments**

- **x**: A `spark_connection`, `ml_pipeline`, or `tbl_spark`.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **k**: The number of principal components.
- **uid**: A character string used to uniquely identify the feature transformer.
- **features**: The columns to use in the principal components analysis. Defaults to all columns in `x`.
- **pc_prefix**: Length-one character vector used to prepend names of components.

**Details**

In the case where `x` is a `tbl_spark`, the estimator fits against `x` to obtain a transformer, which is then immediately used to transform `x`, returning a `tbl_spark`.

`ml_pca()` is a wrapper around `ft_pca()` that returns a `ml_model`.

**Value**

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()

Examples

```r
## Not run:
library(dplyr)

sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

iris_tbl %>%
  select(-Species) %>%
  ml_pca(k = 2)

## End(Not run)
```

---

**ft_polynomial_expansion**

*Feature Transformation – PolynomialExpansion (Transformer)*

**Description**

Perform feature expansion in a polynomial space. E.g. take a 2-variable feature vector as an example: \((x, y)\), if we want to expand it with degree 2, then we get \((x, x \cdot x, y, x \cdot y, y \cdot y)\).

**Usage**

```r
ft_polynomial_expansion(
  x,
  input_col = NULL,
  output_col = NULL,
```
ft_polynomial_expansion

degree = 2,
uid = random_string("polynomial_expansion_"),
...

Arguments

**x**  
A spark_connection, ml_pipeline, or a tbl_spark.

**input_col**  
The name of the input column.

**output_col**  
The name of the output column.

**degree**  
The polynomial degree to expand, which should be greater than equal to 1. A value of 1 means no expansion. Default: 2

**uid**  
A character string used to uniquely identify the feature transformer.

...  
Optional arguments; currently unused.

Value

The object returned depends on the class of x.

- **spark_connection**: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

- **ml_pipeline**: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

- **tbl_spark**: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
ft_quantile_discretizer

Feature Transformation – QuantileDiscretizer (Estimator)

Description

ft_quantile_discretizer takes a column with continuous features and outputs a column with binned categorical features. The number of bins can be set using the num_buckets parameter. It is possible that the number of buckets used will be smaller than this value, for example, if there are too few distinct values of the input to create enough distinct quantiles.

Usage

ft_quantile_discretizer(
  x,
  input_col = NULL,
  output_col = NULL,
  num_buckets = 2,
  input_cols = NULL,
  output_cols = NULL,
  num_buckets_array = NULL,
  handle_invalid = "error",
  relative_error = 0.001,
  uid = random_string("quantile_discretizer_"),
  weight_column = NULL,
  ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
input_col The name of the input column.
output_col The name of the output column.
num_buckets Number of buckets (quantiles, or categories) into which data points are grouped. Must be greater than or equal to 2.
input_cols Names of input columns.
output_cols Names of output columns.
num_buckets_array Array of number of buckets (quantiles, or categories) into which data points are grouped. Each value must be greater than or equal to 2.
handle_invalid (Spark 2.1.0+) Param for how to handle invalid entries. Options are 'skip' (filter out rows with invalid values), 'error' (throw an error), or 'keep' (keep invalid values in a special additional bucket). Default: "error"
relative_error (Spark 2.0.0+) Relative error (see documentation for org.apache.spark.sql.DataFrameStatFunctions.approxQuantile here for description). Must be in the range [0, 1]. default: 0.001
uid
A character string used to uniquely identify the feature transformer.

weight_column
If not NULL, then a generalized version of the Greenwald-Khanna algorithm
will be run to compute weighted percentiles, with each input having a relative
weight specified by the corresponding value in ‘weight_column’. The weights
can be considered as relative frequencies of sample inputs.

... Optional arguments; currently unused.

Details
NaN handling: null and NaN values will be ignored from the column during QuantileDiscretizer
fitting. This will produce a Bucketizer model for making predictions. During the transformation,
Bucketizer will raise an error when it finds NaN values in the dataset, but the user can also choose
to either keep or remove NaN values within the dataset by setting handle_invalid. If the user
chooses to keep NaN values, they will be handled specially and placed into their own bucket, for
example, if 4 buckets are used, then non-NaN data will be put into buckets[0-3], but NaNs will be
counted in a special bucket[4].

Algorithm: The bin ranges are chosen using an approximate algorithm (see the documentation for
org.apache.spark.sql.DataFrameStatFunctions.approxQuantile here for a detailed description). The
precision of the approximation can be controlled with the relative_error parameter. The lower
and upper bin bounds will be -Infinity and +Infinity, covering all real values.

Note that the result may be different every time you run it, since the sample strategy behind it is
non-deterministic.

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is
then immediately used to transform x, returning a tbl_spark.

Value
The object returned depends on the class of x.

• spark_connection: When x is a spark_connection, the function returns a ml_transformer,
a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer
or Estimator object and can be used to compose Pipeline objects.

• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the trans-
former or estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied
to the input tbl_spark, returning a tbl_spark.

See Also
See https://spark.apache.org/docs/latest/ml-features.html for more information on the
set of transformations available for DataFrame columns in Spark.

ft_bucketizer

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(),
ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(),
ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(),
ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(),
ft_pca(), ft_polynomial_expansion(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(),
**ft_regex_tokenizer**

*Feature Transformation – RegexTokenizer (Transformer)*

**Description**

A regex based tokenizer that extracts tokens either by using the provided regex pattern to split the text (default) or repeatedly matching the regex (if `gaps` is false). Optional parameters also allow filtering tokens using a minimal length. It returns an array of strings that can be empty.

**Usage**

```r
ft_regex_tokenizer(
  x,
  input_col = NULL,
  output_col = NULL,
  gaps = TRUE,
  min_token_length = 1,
  pattern = "\s+",
  to_lower_case = TRUE,
  uid = random_string("regex_tokenizer_"),
  ...
)
```

**Arguments**

- `x` A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `input_col` The name of the input column.
- `output_col` The name of the output column.
- `gaps` Indicates whether regex splits on gaps (TRUE) or matches tokens (FALSE).
- `min_token_length` Minimum token length, greater than or equal to 0.
- `pattern` The regular expression pattern to be used.
- `to_lower_case` Indicates whether to convert all characters to lowercase before tokenizing.
- `uid` A character string used to uniquely identify the feature transformer.
- `...` Optional arguments; currently unused.

**Value**

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
ft_robust_scaler

Description

RobustScaler removes the median and scales the data according to the quantile range. The quantile range is by default IQR (Interquartile Range, quantile range between the 1st quartile = 25th quantile and the 3rd quartile = 75th quantile) but can be configured. Centering and scaling happen independently on each feature by computing the relevant statistics on the samples in the training set. Median and quantile range are then stored to be used on later data using the transform method. Note that missing values are ignored in the computation of medians and ranges.

Usage

```r
def_ft_robust_scaler(x,  
    input_col = NULL,  
    output_col = NULL,  
    lower = 0.25,  
    upper = 0.75,  
    with_centering = TRUE,  
    with_scaling = TRUE,  
    relative_error = 0.001,  
    uid = random_string(“ft_robust_scaler_“),  
    ...  
)
```

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
Arguments

- **x** A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col** The name of the input column.
- **output_col** The name of the output column.
- **lower** Lower quantile to calculate quantile range.
- **upper** Upper quantile to calculate quantile range.
- **with_centering** Whether to center data with median.
- **with_scaling** Whether to scale the data to quantile range.
- **relative_error** The target relative error for quantile computation.
- **uid** A character string used to uniquely identify the feature transformer.
- **...** Optional arguments; currently unused.

Details

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is then immediately used to transform x, returning a tbl_spark.

Value

The object returned depends on the class of x.

- **spark_connection**: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remove(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()
ft_r_formula

**Description**

Implements the transforms required for fitting a dataset against an R model formula. Currently we support a limited subset of the R operators, including ~, :, :, +, and −.

**Usage**

```r
ft_r_formula(
  x,
  formula = NULL,
  features_col = "features",
  label_col = "label",
  force_index_label = FALSE,
  uid = random_string("r_formula_"),
  ...
)
```

**Arguments**

- `x`: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `formula`: R formula as a character string or a formula. Formula objects are converted to character strings directly and the environment is not captured.
- `features_col`: Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.
- `label_col`: Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.
- `force_index_label`: (Spark 2.1.0+) Force to index label whether it is numeric or string type. Usually we index label only when it is string type. If the formula was used by classification algorithms, we can force to index label even it is numeric type by setting this param with true. Default: FALSE.
- `uid`: A character string used to uniquely identify the feature transformer.
- `...`: Optional arguments; currently unused.

**Details**

The basic operators in the formula are:

- ~ separate target and terms
- + concat terms, "+ 0" means removing intercept
- - remove a term, "- 1" means removing intercept
Suppose a and b are double columns, we use the following simple examples to illustrate the effect of RFormula:

- \( y \sim a + b \) means model \( y \sim w_0 + w_1 \cdot a + w_2 \cdot b \) where \( w_0 \) is the intercept and \( w_1, w_2 \) are coefficients.
- \( y \sim a + b + a:b - 1 \) means model \( y \sim w_1 \cdot a + w_2 \cdot b + w_3 \cdot a \cdot b \) where \( w_1, w_2, w_3 \) are coefficients.

RFormula produces a vector column of features and a double or string column of label. Like when formulas are used in R for linear regression, string input columns will be one-hot encoded, and numeric columns will be cast to doubles. If the label column is of type string, it will be first transformed to double with StringIndexer. If the label column does not exist in the DataFrame, the output label column will be created from the specified response variable in the formula.

In the case where \( x \) is a tbl_spark, the estimator fits against \( x \) to obtain a transformer, which is then immediately used to transform \( x \), returning a tbl_spark.

### Value

The object returned depends on the class of \( x \).

- **spark_connection**: When \( x \) is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When \( x \) is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When \( x \) is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark.

### See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`
ft_sql_transformer  Feature Transformation – SQLTransformer

Description

Implements the transformations which are defined by SQL statement. Currently we only support SQL syntax like 'SELECT ... FROM __THIS__ ...' where '__THIS__' represents the underlying table of the input dataset. The select clause specifies the fields, constants, and expressions to display in the output, it can be any select clause that Spark SQL supports. Users can also use Spark SQL built-in function and UDFs to operate on these selected columns.

Usage

ft_sql_transformer(
  x,
  statement = NULL,
  uid = random_string("sql_transformer_"),
  ...
)

ft_dplyr_transformer(x, tbl, uid = random_string("dplyr_transformer_")), ...

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
statement A SQL statement.
uid A character string used to uniquely identify the feature transformer.
... Optional arguments; currently unused.
tbl A tbl_spark generated using dplyr transformations.

Details

ft_dplyr_transformer() is mostly a wrapper around ft_sql_transformer() that takes a tbl_spark instead of a SQL statement. Internally, the ft_dplyr_transformer() extracts the dplyr transformations used to generate tbl as a SQL statement or a sampling operation. Note that only single-table dplyr verbs are supported and that the sdf_ family of functions are not.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark.
ft_standard_scaler

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()

---

### ft_standard_scaler

**Feature Transformation – StandardScaler (Estimator)**

---

**Description**

Standardizes features by removing the mean and scaling to unit variance using column summary statistics on the samples in the training set. The "unit std" is computed using the corrected sample standard deviation, which is computed as the square root of the unbiased sample variance.

**Usage**

```r
def ft_standard_scaler(
    x,
    input_col = NULL,
    output_col = NULL,
    with_mean = FALSE,
    with_std = TRUE,
    uid = random_string("standard_scaler_"),
    ...
)
```

**Arguments**

- `x` A spark_connection, ml_pipeline, or a tbl_spark.
- `input_col` The name of the input column.
- `output_col` The name of the output column.
- `with_mean` Whether to center the data with mean before scaling. It will build a dense output, so take care when applying to sparse input. Default: FALSE
- `with_std` Whether to scale the data to unit standard deviation. Default: TRUE
- `uid` A character string used to uniquely identify the feature transformer.
- `...` Optional arguments; currently unused.
Details

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is then immediately used to transform x, returning a tbl_spark.

Value

The object returned depends on the class of x.

• spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_indexer(), ft_vector_slicer(), ft_word2vec()

Examples

```r
## Not run:
sd <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)
features <- c("Sepal_Length", "Sepal_Width", "Petal_Length", "Petal_Width")
iris_tbl %>%
  ft_vector_assembler(
    input_col = features,
    output_col = "features_temp"
  ) %>%
  ft_standard_scaler(
    input_col = "features_temp",
    output_col = "features",
    with_mean = TRUE
  )
## End(Not run)
```
ft_stop_words_remover  

Feature Transformation – StopWordsRemover (Transformer)

Description
A feature transformer that filters out stop words from input.

Usage
```
ft_stop_words_remover(
  x,
  input_col = NULL,
  output_col = NULL,
  case_sensitive = FALSE,
  stop_words = ml_default_stop_words(spark_connection(x), "english"),
  uid = random_string("stop_words_remover_"),
  ...
)
```

Arguments
- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **case_sensitive**: Whether to do a case sensitive comparison over the stop words.
- **stop_words**: The words to be filtered out.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

Value
The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When `x` is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`
ft_string_indexer

Description

A label indexer that maps a string column of labels to an ML column of label indices. If the input column is numeric, we cast it to string and index the string values. The indices are in \([0, \text{numLabels})\), ordered by label frequencies. So the most frequent label gets index 0. This function is the inverse of `ft_index_to_string`.

Usage

```scala
ft_string_indexer(
  x,
  input_col = NULL,
  output_col = NULL,
  handle_invalid = "error",
  string_order_type = "frequencyDesc",
  uid = random_string("string_indexer_"),
  ...)
```

```scala
ml_labels(model)
```

```scala
ft_string_indexer_model(
  x,
  input_col = NULL,
  output_col = NULL,
  labels,
  handle_invalid = "error",
  uid = random_string("string_indexer_model_"),
  ...
)
```
Arguments

- x: A spark_connection, ml_pipeline, or a tbl_spark.
- input_col: The name of the input column.
- output_col: The name of the output column.
- handle_invalid: (Spark 2.1.0+) Param for how to handle invalid entries. Options are 'skip' (filter out rows with invalid values), 'error' (throw an error), or 'keep' (keep invalid values in a special additional bucket). Default: "error"
- string_order_type: (Spark 2.3+) How to order labels of string column. The first label after ordering is assigned an index of 0. Options are "frequencyDesc", "frequencyAsc", "alphabetDesc", and "alphabetAsc". Defaults to "frequencyDesc".
- uid: A character string used to uniquely identify the feature transformer.
- ...: Optional arguments; currently unused.
- model: A fitted StringIndexer model returned by ft_string_indexer()
- labels: Vector of labels, corresponding to indices to be assigned.

Details

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is then immediately used to transform x, returning a tbl_spark.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

ml_labels() returns a vector of labels, corresponding to indices to be assigned.

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

- ft_index_to_string
- ft_binarizer()
- ft_bucketizer()
- ft_chisq_selector()
- ft_count_vectorizer()
- ft_dct()
- ft_elementwise_product()
- ft_feature hasher()
- ft_hashing_tf()
- ft_idf()
- ft_imputer()
- ft_index_to_string()
- ft_interaction()
- ft_lsh
- ft_max_abs_scaler()
- ft_min_max_scaler()
- ft_ngram()
- ft_normalizer()
- ft_one_hot_encoder_estimator()
- ft_one_hot_encoder()
- ft_pca()
- ft_polynomial_expansion()
- ft_quantile_discretizer()
- ft_r_formula()
- ft_regex_tokenizer()
- ft_robust_scaler()
- ft_sql_transformer()
- ft_standard_scaler()
- ft_stop_words_remover()
- ft_tokenizer()
- ft_vector_assembler()
- ft_vector_indexer()
- ft_vector_slicer()
- ft_word2vec()
**ft_tokenizer**  
*Feature Transformation – Tokenizer (Transformer)*

**Description**
A tokenizer that converts the input string to lowercase and then splits it by white spaces.

**Usage**
```r
ft_tokenizer(
  x,
  input_col = NULL,
  output_col = NULL,
  uid = random_string("tokenizer_"),
  ...
)
```

**Arguments**
- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.

**Value**
The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When `x` is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When `x` is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

**See Also**
See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hasing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`.
ft_vector_assembler

Description

Combine multiple vectors into a single row-vector; that is, where each row element of the newly generated column is a vector formed by concatenating each row element from the specified input columns.

Usage

```r
ft_vector_assembler(
  x,
  input_cols = NULL,
  output_col = NULL,
  uid = random_string("vector_assembler_"),
  ...
)
```

Arguments

- `x`: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `input_cols`: The names of the input columns.
- `output_col`: The name of the output column.
- `uid`: A character string used to uniquely identify the feature transformer.
- `...`: Optional arguments; currently unused.

Value

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns a `ml_transformer`, a `ml_estimator`, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- `ml_pipeline`: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the transformer or estimator appended to the pipeline.
- `tbl_spark`: When `x` is a `tbl_spark`, a transformer is constructed then immediately applied to the input `tbl_spark`, returning a `tbl_spark`
See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder_estimator()`, `ft_one_hot_encoder()`, `ft_pca()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_indexer()`, `ft_vector_slicer()`, `ft_word2vec()`

---

**ft_vector_indexer**

**Feature Transformation – VectorIndexer (Estimator)**

**Description**

Indexing categorical feature columns in a dataset of Vector.

**Usage**

```r
ft_vector_indexer(
  x,
  input_col = NULL,
  output_col = NULL,
  handle_invalid = "error",
  max_categories = 20,
  uid = random_string("vector_indexer_"),
  ...
)
```

**Arguments**

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **input_col**: The name of the input column.
- **output_col**: The name of the output column.
- **handle_invalid** (Spark 2.1.0+) Param for how to handle invalid entries. Options are 'skip' (filter out rows with invalid values), 'error' (throw an error), or 'keep' (keep invalid values in a special additional bucket). Default: "error"
- **max_categories**: Threshold for the number of values a categorical feature can take. If a feature is found to have > max_categories values, then it is declared continuous. Must be greater than or equal to 2. Defaults to 20.
- **uid**: A character string used to uniquely identify the feature transformer.
- **...**: Optional arguments; currently unused.
Details

In the case where \( x \) is a tbl_spark, the estimator fits against \( x \) to obtain a transformer, which is then immediately used to transform \( x \), returning a tbl_spark.

Value

The object returned depends on the class of \( x \).

- **spark_connection**: When \( x \) is a spark_connection, the function returns a ml_transformer, a ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
- **ml_pipeline**: When \( x \) is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.
- **tbl_spark**: When \( x \) is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

See Also

See [https://spark.apache.org/docs/latest/ml-features.html](https://spark.apache.org/docs/latest/ml-features.html) for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: ft_binarizer(), ft_bucketizer(), ft_chisq_selector(), ft_count_vectorizer(), ft_dct(), ft_elementwise_product(), ft_feature_hasher(), ft_hashing_tf(), ft_idf(), ft_imputer(), ft_index_to_string(), ft_interaction(), ft_lsh, ft_max_abs_scaler(), ft_min_max_scaler(), ft_ngram(), ft_normalizer(), ft_one_hot_encoder_estimator(), ft_one_hot_encoder(), ft_pca(), ft_polynomial_expansion(), ft_quantile_discretizer(), ft_r_formula(), ft_regex_tokenizer(), ft_robust_scaler(), ft_sql_transformer(), ft_standard_scaler(), ft_stop_words_remover(), ft_string_indexer(), ft_tokenizer(), ft_vector_assembler(), ft_vector_slicer(), ft_word2vec()

---

### ft_vector_slicer

**Description**

Takes a feature vector and outputs a new feature vector with a subarray of the original features.

**Usage**

```r
ft_vector_slicer(
  x,
  input_col = NULL,
  output_col = NULL,
  indices = NULL,
  uid = random_string("vector_slicer_"),
  ...
)
```
Arguments

\begin{itemize}
    \item \text{\texttt{x}}: A \texttt{spark_connection}, \texttt{ml_pipeline}, or a \texttt{tbl_spark}.
    \item \text{\texttt{input_col}}: The name of the input column.
    \item \text{\texttt{output_col}}: The name of the output column.
    \item \text{\texttt{indices}}: An vector of indices to select features from a vector column. Note that the indices are 0-based.
    \item \text{\texttt{uid}}: A character string used to uniquely identify the feature transformer.
    \item ...: Optional arguments; currently unused.
\end{itemize}

Value

The object returned depends on the class of \texttt{x}.

\begin{itemize}
    \item \texttt{spark_connection}: When \texttt{x} is a \texttt{spark_connection}, the function returns a \texttt{ml_transformer}, a \texttt{ml_estimator}, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.
    \item \texttt{ml_pipeline}: When \texttt{x} is a \texttt{ml_pipeline}, the function returns a \texttt{ml_pipeline} with the transformer or estimator appended to the pipeline.
    \item \texttt{tbl_spark}: When \texttt{x} is a \texttt{tbl_spark}, a transformer is constructed then immediately applied to the input \texttt{tbl_spark}, returning a \texttt{tbl_spark}
\end{itemize}

See Also

See \url{https://spark.apache.org/docs/latest/ml-features.html} for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: \texttt{ft_binarizer()}, \texttt{ft_bucketizer()}, \texttt{ft_chisq_selector()}, \texttt{ft_count_vectorizer()}, \texttt{ft_dct()}, \texttt{ft_elementwise_product()}, \texttt{ft_feature_hasher()}, \texttt{ft_hashing_tf()}, \texttt{ft_idf()}, \texttt{ft_imputer()}, \texttt{ft_index_to_string()}, \texttt{ft_interaction()}, \texttt{ft_lsh}, \texttt{ft_max_abs_scaler()}, \texttt{ft_min_max_scaler()}, \texttt{ft_ngram()}, \texttt{ft_normalizer()}, \texttt{ft_one_hot_encoder_estimato...}, \texttt{ft_pca()}, \texttt{ft_polynomialExpansion()}, \texttt{ft_quantile_discretizer()}, \texttt{ft_r_formula()}, \texttt{ft_regex_tokenizer()}, \texttt{ft_robust_scaler()}, \texttt{ft_sql_transformer()}, \texttt{ft_standard_scaler()}, \texttt{ft_stop_words_remover()}, \texttt{ft_string_indexer()}, \texttt{ft_tokenizer()}, \texttt{ft_vector_assembler()}, \texttt{ft_vector_indexer()}, \texttt{ft_word2vec()}

---

\textit{ft_word2vec} \hspace{1cm} Feature Transformation – Word2Vec (Estimator)

Description

Word2Vec transforms a word into a code for further natural language processing or machine learning process.
Usage

ft_word2vec(
  x,
  input_col = NULL,
  output_col = NULL,
  vector_size = 100,
  min_count = 5,
  max_sentence_length = 1000,
  num_partitions = 1,
  step_size = 0.025,
  max_iter = 1,
  seed = NULL,
  uid = random_string("word2vec_"),
  ...
)

ml_find_synonyms(model, word, num)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
input_col The name of the input column.
output_col The name of the output column.
vector_size The dimension of the code that you want to transform from words. Default: 100
min_count The minimum number of times a token must appear to be included in the word2vec model’s vocabulary. Default: 5
max_sentence_length (Spark 2.0.0+) Sets the maximum length (in words) of each sentence in the input data. Any sentence longer than this threshold will be divided into chunks of up to max_sentence_length size. Default: 1000
num_partitions Number of partitions for sentences of words. Default: 1
step_size Param for Step size to be used for each iteration of optimization (> 0).
max_iter The maximum number of iterations to use.
seed A random seed. Set this value if you need your results to be reproducible across repeated calls.
uid A character string used to uniquely identify the feature transformer.
... Optional arguments; currently unused.
model A fitted Word2Vec model, returned by ft_word2vec().
word A word, as a length-one character vector.
num Number of words closest in similarity to the given word to find.

Details

In the case where x is a tbl_spark, the estimator fits against x to obtain a transformer, which is then immediately used to transform x, returning a tbl_spark.
Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns an ml_transformer, an ml_estimator, or one of their subclasses. The object contains a pointer to a Spark Transformer or Estimator object and can be used to compose Pipeline objects.

- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the transformer or estimator appended to the pipeline.

- tbl_spark: When x is a tbl_spark, a transformer is constructed then immediately applied to the input tbl_spark, returning a tbl_spark

`ml_find_synonyms()` returns a DataFrame of synonyms and cosine similarities

See Also

See https://spark.apache.org/docs/latest/ml-features.html for more information on the set of transformations available for DataFrame columns in Spark.

Other feature transformers: `ft_binarizer()`, `ft_bucketizer()`, `ft_chisq_selector()`, `ft_count_vectorizer()`, `ft_dct()`, `ft_elementwise_product()`, `ft_feature_hasher()`, `ft_hashing_tf()`, `ft_idf()`, `ft_imputer()`, `ft_index_to_string()`, `ft_interaction()`, `ft_lsh`, `ft_max_abs_scaler()`, `ft_min_max_scaler()`, `ft_ngram()`, `ft_normalizer()`, `ft_one_hot_encoder()`, `ft_one_hot_encoder_estimator()`, `ft_polynomial_expansion()`, `ft_quantile_discretizer()`, `ft_r_formula()`, `ft_regex_tokenizer()`, `ft_robust_scaler()`, `ft_sql_transformer()`, `ft_standard_scaler()`, `ft_stop_words_remover()`, `ft_string_indexer()`, `ft_tokenizer()`, `ft_vector_assembler()`, `ft_vector_indexer()`, `ft_vector_slicer()`
Arguments

-sc spark_connection
-static Is this a static method call (including a constructor). If so then the object parameter should be the name of a class (otherwise it should be a spark_job instance).
-object Object instance or name of class (for static)
-method Name of method
...
Call parameters

get_spark_sql_catalog_implementation

-Retrieve the Spark connection’s SQL catalog implementation property

Description

Retrieve the Spark connection’s SQL catalog implementation property

Usage

get_spark_sql_catalog_implementation(sc)

Arguments

-sc spark_connection

Value

spark.sql.catalogImplementation property from the connection’s runtime configuration

hive_context_config

-Runtime configuration interface for Hive

Description

Retrieves the runtime configuration interface for Hive.

Usage

hive_context_config(sc)

Arguments

-sc A spark_connection.
**hof_aggregate**

**Apply Aggregate Function to Array Column**

**Description**

Apply an element-wise aggregation function to an array column (this is essentially a dplyr wrapper for the `aggregate(array<T>, A, function<A, T, A>[, function<A, R>]): R built-in Spark SQL functions)

**Usage**

```r
hof_aggregate(
  x,
  start,
  merge,
  finish = NULL,
  expr = NULL,
  dest_col = NULL,
  ...
)
```

**Arguments**

<table>
<thead>
<tr>
<th>x</th>
<th>The Spark data frame to run aggregation on</th>
</tr>
</thead>
<tbody>
<tr>
<td>start</td>
<td>The starting value of the aggregation</td>
</tr>
<tr>
<td>merge</td>
<td>The aggregation function</td>
</tr>
<tr>
<td>finish</td>
<td>Optional param specifying a transformation to apply on the final value of the aggregation</td>
</tr>
<tr>
<td>expr</td>
<td>The array being aggregated, could be any SQL expression evaluating to an array (default: the last column of the Spark data frame)</td>
</tr>
<tr>
<td>dest_col</td>
<td>Column to store the aggregated result (default: expr)</td>
</tr>
<tr>
<td>...</td>
<td>Additional params to dplyr::mutate</td>
</tr>
</tbody>
</table>

**Examples**

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local")
# concatenates all numbers of each array in `array_column` and add parentheses around the resulting string
copy_to(sc, tibble::tibble(array_column = list(1:5, 21:25))) %>%
  hof_aggregate(
    start = "",
    merge = ~ CONCAT(.y, .x),
    finish = ~ CONCAT("(", .x, ")")
  )
```
hof_array_sort

Sorts array using a custom comparator

Description

Applies a custom comparator function to sort an array (this is essentially a dplyr wrapper to the `array_sort(expr, func)` higher-order function, which is supported since Spark 3.0)

Usage

```
hof_array_sort(x, func, expr = NULL, dest_col = NULL, ...)```

Arguments

- `x`: The Spark data frame to be processed
- `func`: The comparator function to apply (it should take 2 array elements as arguments and return an integer, with a return value of -1 indicating the first element is less than the second, 0 indicating equality, or 1 indicating the first element is greater than the second)
- `expr`: The array being sorted, could be any SQL expression evaluating to an array (default: the last column of the Spark data frame)
- `dest_col`: Column to store the sorted result (default: expr)
- `...`: Additional params to dplyr::mutate

Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "3.0.0")
copy_to(
  sc,
  tibble::tibble(
    # x contains 2 arrays each having elements in ascending order
    x = list(1:5, 6:10)
  )
)  #>
# now each array from x gets sorted in descending order
hof_array_sort(~ as.integer(sign(.y - .x)))
```

## End(Not run)
**hof_exists**  
*Determine Whether Some Element Exists in an Array Column*

**Description**
Determine whether an element satisfying the given predicate exists in each array from an array column (this is essentially a dplyr wrapper for the `exists(array<T>, function<T, Boolean>): Boolean` built-in Spark SQL function).

**Usage**
```
hof_exists(x, pred, expr = NULL, dest_col = NULL, ...)```

**Arguments**
- `x`: The Spark data frame to search
- `pred`: A boolean predicate
- `expr`: The array being searched (could be any SQL expression evaluating to an array)
- `dest_col`: Column to store the search result
- `...`: Additional params to dplyr::mutate

**hof_filter**  
*Filter Array Column*

**Description**
Apply an element-wise filtering function to an array column (this is essentially a dplyr wrapper for the `filter(array<T>, function<T, Boolean>): array<T>` built-in Spark SQL functions).

**Usage**
```
hof_filter(x, func, expr = NULL, dest_col = NULL, ...)```

**Arguments**
- `x`: The Spark data frame to filter
- `func`: The filtering function
- `expr`: The array being filtered, could be any SQL expression evaluating to an array (default: the last column of the Spark data frame)
- `dest_col`: Column to store the filtered result (default: `expr`)
- `...`: Additional params to dplyr::mutate
Examples

```r
library(sparklyr)
sc <- spark_connect(master = "local")
# only keep odd elements in each array in `array_column`
copy_to(sc, tibble::tibble(array_column = list(1:5, 21:25))) %>%
  hof_filter(~ .x %% 2 == 1)
```

## Not run

**`hof_forall`**

Checks whether all elements in an array satisfy a predicate

### Description

Checks whether the predicate specified holds for all elements in an array (this is essentially a dplyr wrapper to the `forall(expr, pred)` higher-order function, which is supported since Spark 3.0)

### Usage

```r
hof_forall(x, pred, expr = NULL, dest_col = NULL, ...)
```

### Arguments

- **x**: The Spark data frame to be processed
- **pred**: The predicate to test (it should take an array element as argument and return a boolean value)
- **expr**: The array being tested, could be any SQL expression evaluating to an array (default: the last column of the Spark data frame)
- **dest_col**: Column to store the boolean result (default: expr)
- **...**: Additional params to dplyr::mutate

### Examples

```r
sc <- spark_connect(master = "local", version = "3.0.0")
df <- tibble::tibble(
  x = list(c(1, 2, 3, 4, 5), c(6, 7, 8, 9, 10)),
  y = list(c(1, 4, 2, 8, 5), c(7, 1, 4, 2, 8)),
)
sdf <- sdf_copy_to(sc, df, overwrite = TRUE)
all_positive_tbl <- sdf %>%
  hof_forall(pred = ~ .x > 0, expr = y, dest_col = all_positive) %>%
```
hof_map_filter


dplyr::select(all_positive)

## End(Not run)

---

**hof_map_filter**  
*Filters a map*

**Description**

Filters entries in a map using the function specified (this is essentially a dplyr wrapper to the `map_filter(expr, func)` higher-order function, which is supported since Spark 3.0)

**Usage**

```
hof_map_filter(x, func, expr = NULL, dest_col = NULL, ...)
```

**Arguments**

- `x` The Spark data frame to be processed
- `func` The filter function to apply (it should take (key, value) as arguments and return a boolean value, with FALSE indicating the key-value pair should be discarded and TRUE otherwise)
- `expr` The map being filtered, could be any SQL expression evaluating to a map (default: the last column of the Spark data frame)
- `dest_col` Column to store the filtered result (default: expr)
- `...` Additional params to dplyr::mutate

**Examples**

```
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "3.0.0")
sdf <- sdf_len(sc, 1) %>% dplyr::mutate(m = map(1, 0, 2, 2, 3, -1))
filtered_sdf <- sdf %>% hof_map_filter(~ .x > .y)

## End(Not run)
```
Merges two maps into one

Description

Merges two maps into a single map by applying the function specified to pairs of values with the same key (this is essentially a dplyr wrapper to the `map_zip_with(map1, map2, func)' higher-order function, which is supported since Spark 3.0)

Usage

`hof_map_zip_with(x, func, dest_col = NULL, map1 = NULL, map2 = NULL, ...)`

Arguments

- **x** The Spark data frame to be processed
- **func** The function to apply (it should take (key, value1, value2) as arguments, where (key, value1) is a key-value pair present in map1, (key, value2) is a key-value pair present in map2, and return a transformed value associated with key in the resulting map
- **dest_col** Column to store the query result (default: the last column of the Spark data frame)
- **map1** The first map being merged, could be any SQL expression evaluating to a map (default: the first column of the Spark data frame)
- **map2** The second map being merged, could be any SQL expression evaluating to a map (default: the second column of the Spark data frame)
- **...** Additional params to dplyr::mutate

Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "3.0.0")

# create a Spark dataframe with 2 columns of type MAP<STRING, INT>
two_maps_tbl <- sdf_copy_to(
  sc,
  tibble::tibble(
    m1 = c("\"1\":2,\"3\":4,\"5\":6\"), "\"2\":1,\"4\":3,\"6\":5\"),
    m2 = c("\"1\":1,\"3\":3,\"5\":5\"), "\"2\":2,\"4\":4,\"6\":6\")
  ),
  overwrite = TRUE
)

dplyr::mutate(m1 = from_json(m1, "MAP<STRING, INT">),
             m2 = from_json(m2, "MAP<STRING, INT">))
```
# create a 3rd column containing MAP<STRING, INT> values derived from the
# first 2 columns

transformed_two_maps_tbl <- two_maps_tbl %>%
  hof_map_zip_with(
    func = .(k, v1, v2) %>% (CONCAT(k, "\", v1, "\", v2)),
    dest_col = m3
  )

## End(Not run)

---

**Transform Array Column**

**Description**

Apply an element-wise transformation function to an array column (this is essentially a dplyr wrapper for the transform(array<T>, function<T, U>): array<U> and the transform(array<T>, function<T, Int, U>): array<U> built-in Spark SQL functions)

**Usage**

```
hof_transform(x, func, expr = NULL, dest_col = NULL, ...)
```

**Arguments**

- **x**: The Spark data frame to transform
- **func**: The transformation to apply
- **expr**: The array being transformed, could be any SQL expression evaluating to an array (default: the last column of the Spark data frame)
- **dest_col**: Column to store the transformed result (default: expr)
- **...**: Additional params to dplyr::mutate

**Examples**

```r
## Not run:
library(sparklyr)
scc <- spark_connect(master = "local")
# applies the (x -> x * x) transformation to elements of all arrays
.copy_to(sc, tibble::tibble(arr = list(1:5, 21:25))) %>%
  hof_transform(~ .x * .x)

## End(Not run)
```
hof_transform_keys

Transforms keys of a map

Description

Applies the transformation function specified to all keys of a map (this is essentially a dplyr wrapper to the ‘transform_keys(expr, func)’ higher-order function, which is supported since Spark 3.0)

Usage

hof_transform_keys(x, func, expr = NULL, dest_col = NULL, ...)

Arguments

x The Spark data frame to be processed
func The transformation function to apply (it should take (key, value) as arguments and return a transformed key)
expr The map being transformed, could be any SQL expression evaluating to a map (default: the last column of the Spark data frame)
dest_col Column to store the transformed result (default: expr)
... Additional params to dplyr::mutate

Examples

## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "3.0.0")
sdf <- sdf_len(sc, 1) %>% dplyr::mutate(m = map("a", 0L, "b", 2L, "c", -1L))
transformed_sdf <- sdf %>% hof_transform_keys(~ CONCAT(.x, " == ", .y))
## End(Not run)

hof_transform_values

Transforms values of a map

Description

Applies the transformation function specified to all values of a map (this is essentially a dplyr wrapper to the ‘transform_values(expr, func)’ higher-order function, which is supported since Spark 3.0)

Usage

hof_transform_values(x, func, expr = NULL, dest_col = NULL, ...)

**Arguments**

- **x**: The Spark data frame to be processed
- **func**: The transformation function to apply (it should take (key, value) as arguments and return a transformed value)
- **expr**: The map being transformed, could be any SQL expression evaluating to a map (default: the last column of the Spark data frame)
- **dest_col**: Column to store the transformed result (default: `expr`)
- **...**: Additional params to `dplyr::mutate`

**Examples**

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "3.0.0")
sdf <- sdf_len(sc, 1) %>% dplyr::mutate(m = map("a", 0L, "b", 2L, "c", -1L))
transformed_sdf <- sdf %>% hof_transform_values(~ CONCAT(.x, " == ", .y))
## End(Not run)
```

---

**Description**

Applies an element-wise function to combine elements from 2 array columns (this is essentially a `dplyr` wrapper for the `zip_with(array<T>, array<U>, function<T, U, R>): array<R>` built-in function in Spark SQL)

**Usage**

```r
hof_zip_with(x, func, dest_col = NULL, left = NULL, right = NULL, ...)
```

**Arguments**

- **x**: The Spark data frame to process
- **func**: Element-wise combining function to be applied
- **dest_col**: Column to store the query result (default: the last column of the Spark data frame)
- **left**: Any expression evaluating to an array (default: the first column of the Spark data frame)
- **right**: Any expression evaluating to an array (default: the second column of the Spark data frame)
- **...**: Additional params to `dplyr::mutate`
Examples

## Not run:

```r
library(sparklyr)
sc <- spark_connect(master = "local")
# compute element-wise products of 2 arrays from each row of 'left' and 'right'
# and store the result in 'res'
copy_to(sc,
  tibble::tibble(
    left = list(1:5, 21:25),
    right = list(6:10, 16:20),
    res = c(0, 0)
  )
) %>%
  hof_zip_with(~ .x * .y)
## End(Not run)
```

---

**inner_join**  
*Inner join*

**Description**

See `inner_join` for more details.

---

**invoke**  
*Invoke a Method on a JVM Object*

**Description**

Invoke methods on Java object references. These functions provide a mechanism for invoking various Java object methods directly from R.

**Usage**

```r
invoke(jobb, method, ...)
invoke_static(sc, class, method, ...)
invoke_new(sc, class, ...)
```
Arguments

- `job` An R object acting as a Java object reference (typically, a `spark_jobj`).
- `method` The name of the method to be invoked.
- `...` Optional arguments, currently unused.
- `sc` A `spark_connection`.
- `class` The name of the Java class whose methods should be invoked.

Details

Use each of these functions in the following scenarios:

- `invoke` Execute a method on a Java object reference (typically, a `spark_jobj`).
- `invoke_static` Execute a static method associated with a Java class.
- `invoke_new` Invoke a constructor associated with a Java class.

Examples

```r
sc <- spark_connect(master = "spark://HOST:PORT")
spark_context(sc) %>%
  invoke("textFile", "file.csv", 1L) %>%
  invoke("count")
```

**jarray**

*Instantiate a Java array with a specific element type.*

Description

Given a list of Java object references, instantiate an `Array[T]` containing the same list of references, where `T` is a non-primitive type that is more specific than `java.lang.Object`.

Usage

`jarray(sc, x, element_type)`

Arguments

- `sc` A `spark_connection`.
- `x` A list of Java object references.
- `element_type` A valid Java class name representing the generic type parameter of the Java array to be instantiated. Each element of `x` must refer to a Java object that is assignable to `element_type`. 

jfloat_array

**jfloat**

*Instantiate a Java float type.*

**Description**

Instantiate a `java.lang.Float` object with the value specified. NOTE: this method is useful when one has to invoke a Java/Scala method requiring a float (instead of double) type for at least one of its parameters.

**Usage**

`jfloat(sc, x)`

**Arguments**

- **sc**  
  A `spark_connection`.
- **x**  
  A numeric value in R.

**Examples**

```r
sc <- spark_connect(master = "spark://HOST:PORT")

jflt <- jfloat(sc, 1.23e-8)
# jflt is now a reference to a java.lang.Float object
```

---

**jfloat_array**

*Instantiate an Array[Float].*

**Description**

Instantiate an `Array[Float]` object with the value specified. NOTE: this method is useful when one has to invoke a Java/Scala method requiring an `Array[Float]` as one of its parameters.

**Usage**

`jfloat_array(sc, x)`

**Examples**

```r
sc <- spark_connect(master = "spark://HOST:PORT")

string_arr <- jarray(sc, letters, element_type = "java.lang.String")
# string_arr is now a reference to an array of type String[]
```
join.tbl_spark

Arguments

sc  A spark_connection.
x  A numeric vector in R.

Examples

sc <- spark_connect(master = "spark://HOST:PORT")

jflt_arr <- jfloat_array(sc, c(-1.23e-8, 0, -1.23e-8))
# jflt_arr is now a reference an array of java.lang.Float

Description

These functions are wrappers around their 'dplyr' equivalents that set Spark SQL-compliant values for the 'suffix' argument by replacing dots ('.') with underscores ('_'). See [join] for a description of the general purpose of the functions.

Usage

```r
## S3 method for class 'tbl_spark'
inner_join(
x,
y,
by = NULL,
copy = FALSE,
suffix = c("_x", "_y"),
auto_index = FALSE,
...,
sql_on = NULL
)
```

```r
## S3 method for class 'tbl_spark'
left_join(
x,
y,
by = NULL,
copy = FALSE,
suffix = c("_x", "_y"),
auto_index = FALSE,
...,
sql_on = NULL
)
```
## S3 method for class 'tbl_spark'
right_join(
  x,
  y,
  by = NULL,
  copy = FALSE,
  suffix = c("_x", "_y"),
  auto_index = FALSE,
  ...
)

## S3 method for class 'tbl_spark'
full_join(
  x,
  y,
  by = NULL,
  copy = FALSE,
  suffix = c("_x", "_y"),
  auto_index = FALSE,
  ...
)

Arguments

- **x, y**
  A pair of lazy data frames backed by database queries.

- **by**
  A join specification created with `join_by()`, or a character vector of variables to join by.
  If NULL, the default, `*_join()` will perform a natural join, using all variables in common across `x` and `y`. A message lists the variables so that you can check they're correct; suppress the message by supplying `by` explicitly.
  To join on different variables between `x` and `y`, use a `join_by()` specification. For example, join by `a == b` will match `x_a` to `y_b`.
  To join by multiple variables, use a `join_by()` specification with multiple expressions. For example, `join_by(a == b, c == d)` will match `x_a` to `y_b` and `x_c` to `y_d`. If the column names are the same between `x` and `y`, you can shorten this by listing only the variable names, like `join_by(a, c)`.
  `join_by()` can also be used to perform inequality, rolling, and overlap joins. See the documentation at ?join_by for details on these types of joins.
  For simple equality joins, you can alternatively specify a character vector of variable names to join by. For example, by = c("a", "b") joins `x_a` to `y_a` and `x_b` to `y_b`. If variable names differ between `x` and `y`, use a named character vector like `by = c("x_a" = "y_a", "x_b" = "y_b")`.
  To perform a cross-join, generating all combinations of `x` and `y`, see `cross_join()`.

- **copy**
  If `x` and `y` are not from the same data source, and `copy` is TRUE, then `y` will be copied into a temporary table in same database as `x`. `*_join()` will auto-
matically run `ANALYZE` on the created table in the hope that this will make you queries as efficient as possible by giving more data to the query planner. This allows you to join tables across `srcs`, but it's potentially expensive operation so you must opt into it.

**suffix**

If there are non-joined duplicate variables in `x` and `y`, these suffixes will be added to the output to disambiguate them. Should be a character vector of length 2.

**auto_index**

If `copy` is `TRUE`, automatically create indices for the variables in `by`. This may speed up the join if there are matching indexes in `x`.

... Other parameters passed onto methods.

**sql_on**

A custom join predicate as an SQL expression. Usually joins use column equality, but you can perform more complex queries by supply `sql_on` which should be a SQL expression that uses `LHS` and `RHS` aliases to refer to the left-hand side or right-hand side of the join respectively.

### j_invoke

**Invoke a Java function.**

Invoke a Java function and force return value of the call to be retrieved as a Java object reference.

#### Usage

```r
ej_invoke(obj, method, ...)
ej_invoke_static(sc, class, method, ...)
ej_invoke_new(sc, class, ...)
```

#### Arguments

- **obj**: An `R` object acting as a Java object reference (typically, a `spark_jobj`).
- **method**: The name of the method to be invoked.
- **...**: Optional arguments, currently unused.
- **sc**: A `spark_connection`.
- **class**: The name of the Java class whose methods should be invoked.

### left_join

**Left join**

See `left_join` for more details.
**list_sparklyr_jars**  
list all sparklyr-*.jar files that have been built

**Description**

list all sparklyr-*.jar files that have been built

**Usage**

```r
list_sparklyr_jars()
```

---

**livy_config**  
Create a Spark Configuration for Livy

**Description**

Create a Spark Configuration for Livy

**Usage**

```r
livy_config(
  config = spark_config(),
  username = NULL,
  password = NULL,
  negotiate = FALSE,
  custom_headers = list("X-Requested-By" = "sparklyr"),
  proxy = NULL,
  curl_opts = NULL,
  ...
)
```

**Arguments**

- **config**: Optional base configuration
- **username**: The username to use in the Authorization header
- **password**: The password to use in the Authorization header
- **negotiate**: Whether to use gssnegotiate method or not
- **custom_headers**: List of custom headers to append to http requests. Defaults to list("X-Requested-By" = "sparklyr").
- **proxy**: Either NULL or a proxy specified by http::use_proxy(). Defaults to NULL.
- **curl_opts**: List of CURL options (e.g., verbose, connecttimeout, dns_cache_timeout, etc, see http::httr_options() for a list of valid options) – NOTE: these configurations are for libcurl only and separate from HTTP headers or Livy session parameters.
- **...**: additional Livy session parameters
**Details**

Extends a Spark `spark_config()` configuration with settings for Livy. For instance, `username` and `password` define the basic authentication settings for a Livy session.

The default value of "custom_headers" is set to `list("X-Requested-By" = "sparklyr")` in order to facilitate connection to Livy servers with CSRF protection enabled.

Additional parameters for Livy sessions are:

- `proxy_user`  User to impersonate when starting the session
- `jars`  jars to be used in this session
- `py_files`  Python files to be used in this session
- `files`  files to be used in this session
- `driver_memory`  Amount of memory to use for the driver process
- `driver_cores`  Number of cores to use for the driver process
- `executor_memory`  Amount of memory to use per executor process
- `executor_cores`  Number of cores to use for each executor
- `num_executors`  Number of executors to launch for this session
- `archives`  Archives to be used in this session
- `queue`  The name of the YARN queue to which submitted
- `name`  The name of this session
- `heartbeat_timeout`  Timeout in seconds to which session be orphaned
- `conf`  Spark configuration properties (Map of key=value)

Note that `queue` is supported only by version 0.4.0 of Livy or newer. If you are using the older one, specify queue via `config` (e.g. `config = spark_config(spark.yarn.queue = "my_queue")`).

**Value**

Named list with configuration data

---

**livy_service_start**  
*Start Livy*

**Description**

Starts the livy service.

Stops the running instances of the livy service.
Usage

```
livy_service_start(
    version = NULL,
    spark_version = NULL,
    stdout = "",
    stderr = "",
    ...
)
```

```
livy_service_stop()
```

Arguments

`version`  
The version of ‘livy’ to use.

`spark_version`  
The version of ‘spark’ to connect to.

`stdout`, `stderr`  
where output to ‘stdout’ or ‘stderr’ should be sent. Same options as `system2`.

`...`  
Optional arguments; currently unused.

---

`ml-params`  

`Spark ML – ML Params`

Description

Helper methods for working with parameters for ML objects.

Usage

```
ml_is_set(x, param, ...)
```

```
ml_param_map(x, ...)
```

```
ml_param(x, param, allow_null = FALSE, ...)
```

```
ml_params(x, params = NULL, allow_null = FALSE, ...)
```

Arguments

`x`  
A Spark ML object, either a pipeline stage or an evaluator.

`param`  
The parameter to extract or set.

`...`  
Optional arguments; currently unused.

`allow_null`  
Whether to allow NULL results when extracting parameters. If FALSE, an error will be thrown if the specified parameter is not found. Defaults to FALSE.

`params`  
A vector of parameters to extract.
Spark ML – Model Persistence

Description

Save/load Spark ML objects

Usage

ml_save(x, path, overwrite = FALSE, ...)

## S3 method for class 'ml_model'
ml_save(
  x,
  path,
  overwrite = FALSE,
  type = c("pipeline_model", "pipeline"),
  ...
)

ml_load(sc, path)

Arguments

- x: A ML object, which could be a ml_pipeline_stage or a ml_model
- path: The path where the object is to be serialized/deserialized.
- overwrite: Whether to overwrite the existing path, defaults to FALSE.
- ...: Optional arguments; currently unused.
- type: Whether to save the pipeline model or the pipeline.
- sc: A Spark connection.

Value

ml_save() serializes a Spark object into a format that can be read back into sparklyr or by the Scala or PySpark APIs. When called on ml_model objects, i.e. those that were created via the tbl_spark - formula signature, the associated pipeline model is serialized. In other words, the saved model contains both the data processing (RFormulaModel) stage and the machine learning stage.

ml_load() reads a saved Spark object into sparklyr. It calls the correct Scala load method based on parsing the saved metadata. Note that a PipelineModel object saved from a sparklyr ml_model via ml_save() will be read back in as an ml_pipeline_model, rather than the ml_model object.
ml-transform-methods  Spark ML – Transform, fit, and predict methods (ml_ interface)

Description

Methods for transformation, fit, and prediction. These are mirrors of the corresponding sdf-transform-methods.

Usage

is_ml_transformer(x)

is_ml_estimator(x)

ml_fit(x, dataset, ...)

ml_transform(x, dataset, ...)

ml_fit_and_transform(x, dataset, ...)

ml_predict(x, dataset, ...)

## S3 method for class 'ml_model_classification'
ml_predict(x, dataset, probability_prefix = "probability_", ...)

Arguments

x  A ml_estimator, ml_transformer (or a list thereof), or ml_model object.
dataset  A tbl_spark.
...  Optional arguments; currently unused.
probability_prefix
     String used to prepend the class probability output columns.

Details

These methods are

Value

When x is an estimator, ml_fit() returns a transformer whereas ml_fit_and_transform() returns a transformed dataset. When x is a transformer, ml_transform() and ml_predict() return a transformed dataset. When ml_predict() is called on a ml_model object, additional columns (e.g. probabilities in case of classification models) are appended to the transformed output for the user’s convenience.
Description

Perform hyper-parameter tuning using either K-fold cross validation or train-validation split.

Usage

ml_sub_models(model)

ml_validation_metrics(model)

ml_cross_validator(
  x,
  estimator = NULL,
  estimator_param_maps = NULL,
  evaluator = NULL,
  num_folds = 3,
  collect_sub_models = FALSE,
  parallelism = 1,
  seed = NULL,
  uid = random_string("cross_validator_"),
  ...
)

ml_train_validation_split(
  x,
  estimator = NULL,
  estimator_param_maps = NULL,
  evaluator = NULL,
  train_ratio = 0.75,
  collect_sub_models = FALSE,
  parallelism = 1,
  seed = NULL,
  uid = random_string("train_validation_split_"),
  ...
)

Arguments

model A cross validation or train-validation-split model.
x A spark_connection, ml_pipeline, or a tbl_spark.
estimator A ml_estimator object.
estimator_param_maps A named list of stages and hyper-parameter sets to tune. See details.
evaluator A ml_evaluator object, see ml_evaluator.
num_folds Number of folds for cross validation. Must be >= 2. Default: 3
collect_sub_models Whether to collect a list of sub-models trained during tuning. If set to FALSE, then only the single best sub-model will be available after fitting. If set to true, then all sub-models will be available. Warning: For large models, collecting all sub-models can cause OOMs on the Spark driver.
parallelism The number of threads to use when running parallel algorithms. Default is 1 for serial execution.
seed A random seed. Set this value if you need your results to be reproducible across repeated calls.
uid A character string used to uniquely identify the ML estimator.
... Optional arguments; currently unused.
train_ratio Ratio between train and validation data. Must be between 0 and 1. Default: 0.75

Details

ml_cross_validator() performs k-fold cross validation while ml_train_validation_split() performs tuning on one pair of train and validation datasets.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns an instance of a ml_cross_validator or ml_train_validation_split object.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the tuning estimator appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a tuning estimator is constructed then immediately fit with the input tbl_spark, returning a ml_cross_validation_model or a ml_train_validation_split_model object.

For cross validation, ml_sub_models() returns a nested list of models, where the first layer represents fold indices and the second layer represents param maps. For train-validation split, ml_sub_models() returns a list of models, corresponding to the order of the estimator param maps.

ml_validation_metrics() returns a data frame of performance metrics and hyperparameter combinations.

Examples

```r
# Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

# Create a pipeline
pipeline <- ml_pipeline(sc) %>%
  ft_r_formula(Species ~ .) %>%
```
ml_random_forest_classifier()

# Specify hyperparameter grid
grid <- list(
  random_forest = list(
    num_trees = c(5, 10),
    max_depth = c(5, 10),
    impurity = c("entropy", "gini")
  )
)

# Create the cross validator object
cv <- ml_cross_validator(
  sc,
  estimator = pipeline, estimator_param_maps = grid,
  evaluator = ml_multiclass_classification_evaluator(sc),
  num_folds = 3,
  parallelism = 4
)

# Train the models
cv_model <- ml_fit(cv, iris_tbl)

# Print the metrics
ml_validation_metrics(cv_model)

---

ml_aft_survival_regression

_Spark ML – Survival Regression_

**Description**

Fit a parametric survival regression model named accelerated failure time (AFT) model (see Accelerated failure time model (Wikipedia)) based on the Weibull distribution of the survival time.

**Usage**

```r
ml_aft_survival_regression(
  x,
  formula = NULL,
  censor_col = "censor",
  quantile_probabilities = c(0.01, 0.05, 0.1, 0.25, 0.5, 0.75, 0.9, 0.95, 0.99),
  fit_intercept = TRUE,
  max_iter = 100L,
  tol = 1e-06,
  aggregation_depth = 2,
)```
quantiles_col = NULL,
features_col = "features",
label_col = "label",
prediction_col = "prediction",
uid = random_string("aft_survival_regression_"),
...)

ml_survival_regression(
x,
formula = NULL,
censor_col = "censor",
quantile_probabilities = c(0.01, 0.05, 0.1, 0.25, 0.5, 0.75, 0.9, 0.95, 0.99),
fit_intercept = TRUE,
max_iter = 100L,
tol = 1e-06,
aggregation_depth = 2,
quantiles_col = NULL,
features_col = "features",
label_col = "label",
prediction_col = "prediction",
uid = random_string("aft_survival_regression_"),
response = NULL,
features = NULL,
...)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.
censor_col Censor column name. The value of this column could be 0 or 1. If the value is 1, it means the event has occurred i.e. uncensored; otherwise censored.
quantile_probabilities Quantile probabilities array. Values of the quantile probabilities array should be in the range (0, 1) and the array should be non-empty.
fit_intercept Boolean; should the model be fit with an intercept term?
max_iter The maximum number of iterations to use.
tol Param for the convergence tolerance for iterative algorithms.
aggregation_depth (Spark 2.1.0+) Suggested depth for treeAggregate (>= 2).
quantiles_col Quatiles column name. This column will output quantiles of corresponding quantileProbabilities if it is set.
features_col  Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.

label_col  Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.

prediction_col  Prediction column name.

uid  A character string used to uniquely identify the ML estimator.

response  (Deprecated) The name of the response column (as a length-one character vector.)

features  (Deprecated) The name of features (terms) to use for the model fit.

Details

When `x` is a `tbl_spark` and `formula` (alternatively, `response` and `features`) is specified, the function returns a `ml_model` object wrapping a `ml_pipeline_model` which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument `predicted_label_col` (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted `ml_pipeline_model`, `ml_model` objects also contain a `ml_pipeline` object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by `ml_save` with type = "pipeline" to facilitate model refresh workflows.

`ml_survival_regression()` is an alias for `ml_aft_survival_regression()` for backwards compatibility.

Value

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns an instance of a `ml_estimator` object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- `ml_pipeline`: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the predictor appended to the pipeline.
- `tbl_spark`: When `x` is a `tbl_spark`, a predictor is constructed then immediately fit with the input `tbl_spark`, returning a prediction model.
- `tbl_spark`, with `formula`: specified When `formula` is specified, the input `tbl_spark` is first transformed using a `RFormula` transformer before being fit by the predictor. The object returned in this case is a `ml_model` which is a wrapper of a `ml_pipeline_model`.

See Also

See [https://spark.apache.org/docs/latest/ml-classification-regression.html](https://spark.apache.org/docs/latest/ml-classification-regression.html) for more information on the set of supervised learning algorithms.

Other ml algorithms: `ml_decision_tree_classifier()`, `ml_gbt_classifier()`, `ml_generalized_linear_regression()`, `ml_isotonic_regression()`, `ml_linear_regression()`, `ml_linear_svc()`, `ml_logistic_regression()`, `ml_multilayer_perceptron_classifier()`, `ml_naive_bayes()`, `ml_one_vs_rest()`,
Examples

## Not run:

```r
library(survival)
library(sparklyr)

sc <- spark_connect(master = "local")
ovarian_tbl <- sdf_copy_to(sc, ovarian, name = "ovarian_tbl", overwrite = TRUE)

partitions <- ovarian_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

ovarian_training <- partitions$training
ovarian_test <- partitions$test

sur_reg <- ovarian_training %>%
  ml_aft_survival_regression(futime ~ ecog_ps + rx + age + resid_ds, censor_col = "fustat")

pred <- ml_predict(sur_reg, ovarian_test)
pred

## End(Not run)
```

### ml_als

#### Spark ML – ALS

**Description**

Perform recommendation using Alternating Least Squares (ALS) matrix factorization.

**Usage**

```r
ml_als(
  x,
  formula = NULL,
  rating_col = "rating",
  user_col = "user",
  item_col = "item",
  rank = 10,
  reg_param = 0.1,
  implicit_prefs = FALSE,
  alpha = 1,
  nonnegative = FALSE,
  max_iter = 10,
  num_user_blocks = 10,
  num_item_blocks = 10,
  checkpoint_interval = 10,
)```

---
cold_start_strategy = "nan",
intermediate_storage_level = "MEMORY_AND_DISK",
final_storage_level = "MEMORY_AND_DISK",
uid = random_string("als_"),
...
)

ml_recommend(model, type = c("items", "users"), n = 1)

Arguments

**x**  
A spark_connection, ml_pipeline, or a tbl_spark.

**formula**  
Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see \texttt{ft_r_formula} for details. The ALS model requires a specific formula format, please use \texttt{rating_col \sim user_col + item_col}.

**rating_col**  
Column name for ratings. Default: "rating"

**user_col**  
Column name for user ids. Ids must be integers. Other numeric types are supported for this column, but will be cast to integers as long as they fall within the integer value range. Default: "user"

**item_col**  
Column name for item ids. Ids must be integers. Other numeric types are supported for this column, but will be cast to integers as long as they fall within the integer value range. Default: "item"

**rank**  
Rank of the matrix factorization (positive). Default: 10

**reg_param**  
Regularization parameter.

**implicit_prefs**  
Whether to use implicit preference. Default: FALSE.

**alpha**  
Alpha parameter in the implicit preference formulation (nonnegative).

**nonnegative**  
Whether to apply nonnegativity constraints. Default: FALSE.

**max_iter**  
Maximum number of iterations.

**num_user_blocks**  
Number of user blocks (positive). Default: 10

**num_item_blocks**  
Number of item blocks (positive). Default: 10

**checkpoint_interval**  
Set checkpoint interval (>= 1) or disable checkpoint (-1). E.g. 10 means that the cache will get checkpointed every 10 iterations, defaults to 10.

**cold_start_strategy**  
(Spark 2.2.0+) Strategy for dealing with unknown or new users/items at prediction time. This may be useful in cross-validation or production scenarios, for handling user/item ids the model has not seen in the training data. Supported values: - "nan": predicted value for unknown ids will be NaN. - "drop": rows in the input DataFrame containing unknown ids will be dropped from the output DataFrame containing predictions. Default: "nan".

**intermediate_storage_level**  
(Spark 2.0.0+) StorageLevel for intermediate datasets. Pass in a string representation of StorageLevel. Cannot be "NONE". Default: "MEMORY_AND_DISK".
final_storage_level

(Spark 2.0.0+) StorageLevel for ALS model factors. Pass in a string representation of StorageLevel. Default: "MEMORY_AND_DISK".

uid

A character string used to uniquely identify the ML estimator.

... Optional arguments; currently unused.

model

An ALS model object

type

What to recommend, one of items or users

n

Maximum number of recommendations to return

Details

ml_recommend() returns the top n users/items recommended for each item/user, for all items/users. The output has been transformed (exploded and separated) from the default Spark outputs to be more user friendly.

Value

ALS attempts to estimate the ratings matrix R as the product of two lower-rank matrices, X and Y, i.e. X * Yt = R. Typically these approximations are called 'factor' matrices. The general approach is iterative. During each iteration, one of the factor matrices is held constant, while the other is solved for using least squares. The newly-solved factor matrix is then held constant while solving for the other factor matrix.

This is a blocked implementation of the ALS factorization algorithm that groups the two sets of factors (referred to as "users" and "products") into blocks and reduces communication by only sending one copy of each user vector to each product block on each iteration, and only for the product blocks that need that user’s feature vector. This is achieved by pre-computing some information about the ratings matrix to determine the "out-links" of each user (which blocks of products it will contribute to) and "in-link" information for each product (which of the feature vectors it receives from each user block it will depend on). This allows us to send only an array of feature vectors between each user block and product block, and have the product block find the users’ ratings and update the products based on these messages.

For implicit preference data, the algorithm used is based on "Collaborative Filtering for Implicit Feedback Datasets", available at doi:10.1109/ICDM.2008.22, adapted for the blocked approach used here.

Essentially instead of finding the low-rank approximations to the rating matrix R, this finds the approximations for a preference matrix P where the elements of P are 1 if r is greater than 0 and 0 if r is less than or equal to 0. The ratings then act as 'confidence' values related to strength of indicated user preferences rather than explicit ratings given to items.

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns an instance of a ml_als recommender object, which is an Estimator.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the recommender appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a recommender estimator is constructed then immediately fit with the input tbl_spark, returning a recommendation model, i.e. ml_als_model.
Examples

```r
## Not run:

library(sparklyr)
sc <- spark_connect(master = "local")
movies <- data.frame(
    user = c(1, 2, 0, 1, 2, 0),
    item = c(1, 1, 1, 2, 2, 0),
    rating = c(3, 1, 2, 4, 5, 4)
)
movies_tbl <- sdf_copy_to(sc, movies)
model <- ml_als(movies_tbl, rating ~ user + item)
ml_predict(model, movies_tbl)
ml_recommend(model, type = "item", 1)
## End(Not run)
```

### Description

These methods summarize the results of Spark ML models into tidy forms.

### Usage

```r
## S3 method for class 'ml_model_als'
tidy(x, ...)

## S3 method for class 'ml_model_als'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_als'
glance(x, ...)
```

### Arguments

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.
ml_bisecting_kmeans  Spark ML – Bisecting K-Means Clustering

Description

A bisecting k-means algorithm based on the paper "A comparison of document clustering techniques" by Steinbach, Karypis, and Kumar, with modification to fit Spark. The algorithm starts from a single cluster that contains all points. Iteratively it finds divisible clusters on the bottom level and bisects each of them using k-means, until there are k leaf clusters in total or no leaf clusters are divisible. The bisecting steps of clusters on the same level are grouped together to increase parallelism. If bisecting all divisible clusters on the bottom level would result more than k leaf clusters, larger clusters get higher priority.

Usage

ml_bisecting_kmeans(
  x, 
  formula = NULL, 
  k = 4, 
  max_iter = 20, 
  seed = NULL, 
  min_divisible_cluster_size = 1, 
  features_col = "features", 
  prediction_col = "prediction", 
  uid = random_string("bisecting_bisecting_kmeans_"), 

  ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.
k The number of clusters to create
max_iter The maximum number of iterations to use.
seed A random seed. Set this value if you need your results to be reproducible across repeated calls.
min_divisible_cluster_size The minimum number of points (if greater than or equal to 1.0) or the minimum proportion of points (if less than 1.0) of a divisible cluster (default: 1.0).
features_col Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by ft_r_formula.
prediction_col Prediction column name.
uid  A character string used to uniquely identify the ML estimator.

...  Optional arguments, see Details.

Value

The object returned depends on the class of x.

• spark_connection: When x is a spark_connection, the function returns an instance of a
  ml_estimator object. The object contains a pointer to a Spark Estimator object and can be
  used to compose Pipeline objects.

• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the clus-
  tering estimator appended to the pipeline.

• tbl_spark: When x is a tbl_spark, an estimator is constructed then immediately fit with the
  input tbl_spark, returning a clustering model.

• tbl_spark, with formula or features specified: When formula is specified, the input
  tbl_spark is first transformed using a RFormula transformer before being fit by the estimator.
  The object returned in this case is a ml_model which is a wrapper of a ml_pipeline_model.
  This signature does not apply to ml_lda().

See Also

See https://spark.apache.org/docs/latest/ml-clustering.html for more information on
the set of clustering algorithms.

Other ml clustering algorithms: ml_gaussian_mixture(), ml_kmeans(), ml_lda()

Examples

## Not run:
library(dplyr)
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)
iris_tbl %>%
  select(-Species) %>%
  ml_bisecting_kmeans(k = 4, Species ~ .)

## End(Not run)

---

**ml_chisquare_test**  Chi-square hypothesis testing for categorical data.

**Description**

Conduct Pearson’s independence test for every feature against the label. For each feature, the
(feature, label) pairs are converted into a contingency matrix for which the Chi-squared statistic is
computed. All label and feature values must be categorical.
Usage

```
ml_chisquare_test(x, features, label)
```

Arguments

- `x` A tbl_spark.
- `features` The name(s) of the feature columns. This can also be the name of a single vector column created using `ft_vector_assembler()`.
- `label` The name of the label column.

Value

A data frame with one row for each (feature, label) pair with p-values, degrees of freedom, and test statistics.

Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc,iris, name = "iris_tbl", overwrite = TRUE)
features <- c("Petal_Width", "Petal_Length", "Sepal_Length", "Sepal_Width")
ml_chisquare_test(iris_tbl, features = features, label = "Species")
## End(Not run)
```

---

**ml_clustering_evaluator**

*Spark ML - Clustering Evaluator*

Description

Evaluator for clustering results. The metric computes the Silhouette measure using the squared Euclidean distance. The Silhouette is a measure for the validation of the consistency within clusters. It ranges between 1 and -1, where a value close to 1 means that the points in a cluster are close to the other points in the same cluster and far from the points of the other clusters.

Usage

```
ml_clustering_evaluator(
  x,
  features_col = "features",
  prediction_col = "prediction",
  metric_name = "silhouette",
  uid = random_string("clustering_evaluator_"),
  ...
)
```
Arguments

- **x**: A spark_connection object or a tbl_spark containing label and prediction columns. The latter should be the output of `sdf_predict`.
- **features_col**: Name of features column.
- **prediction_col**: Name of the prediction column.
- **metric_name**: The performance metric. Currently supports "silhouette".
- **uid**: A character string used to uniquely identify the ML estimator.
- **...**: Optional arguments; currently unused.

Value

The calculated performance metric

Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

formula <- Species ~ .

# Train the models
kmeans_model <- ml_kmeans(iris_training, formula = formula)
b_kmeans_model <- ml_bisecting_kmeans(iris_training, formula = formula)
gmm_model <- ml_gaussian_mixture(iris_training, formula = formula)

# Predict
pred_kmeans <- ml_predict(kmeans_model, iris_test)
pred_b_kmeans <- ml_predict(b_kmeans_model, iris_test)
pred_gmm <- ml_predict(gmm_model, iris_test)

# Evaluate
ml_clustering_evaluator(pred_kmeans)
ml_clustering_evaluator(pred_b_kmeans)
ml_clustering_evaluator(pred_gmm)

## End(Not run)
```
**ml_corr**

*Compute correlation matrix*

**Description**

Compute correlation matrix

**Usage**

```r
ml_corr(x, columns = NULL, method = c("pearson", "spearman"))
```

**Arguments**

- `x` A tbl_spark.
- `columns` The names of the columns to calculate correlations of. If only one column is specified, it must be a vector column (for example, assembled using `ft_vector_assembler()`).
- `method` The method to use, either "pearson" or "spearman".

**Value**

A correlation matrix organized as a data frame.

**Examples**

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)
features <- c("Petal_Width", "Petal_Length", "Sepal_Length", "Sepal_Width")
ml_corr(iris_tbl, columns = features, method = "pearson")
## End(Not run)
```

---

**ml_decision_tree_classifier**

*Spark ML – Decision Trees*

**Description**

Perform classification and regression using decision trees.
### Usage

```r
ml_decision_tree_classifier(
  x,
  formula = NULL,
  max_depth = 5,
  max_bins = 32,
  min_instances_per_node = 1,
  min_info_gain = 0,
  impurity = "gini",
  seed = NULL,
  thresholds = NULL,
  cache_node_ids = FALSE,
  checkpoint_interval = 10,
  max_memory_in_mb = 256,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  uid = random_string("decision_tree_classifier_"),
  ...
)
```

```r
ml_decision_tree(
  x,
  formula = NULL,
  type = c("auto", "regression", "classification"),
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  variance_col = NULL,
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  checkpoint_interval = 10L,
  impurity = "auto",
  max_bins = 32L,
  max_depth = 5L,
  min_info_gain = 0,
  min_instances_per_node = 1L,
  seed = NULL,
  thresholds = NULL,
  cache_node_ids = FALSE,
  max_memory_in_mb = 256L,
  uid = random_string("decision_tree_"),
  response = NULL,
  features = NULL,
  ...
)
```
ml_decision_tree_regressor(
  x,
  formula = NULL,
  max_depth = 5,
  max_bins = 32,
  min_instances_per_node = 1,
  min_info_gain = 0,
  impurity = "variance",
  seed = NULL,
  cache_node_ids = FALSE,
  checkpoint_interval = 10,
  max_memory_in_mb = 256,
  variance_col = NULL,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  uid = random_string("decision_tree_regressor_"),
  ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.

formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.

max_depth Maximum depth of the tree (>= 0); that is, the maximum number of nodes separating any leaves from the root of the tree.

max_bins The maximum number of bins used for discretizing continuous features and for choosing how to split on features at each node. More bins give higher granularity.

min_instances_per_node Minimum number of instances each child must have after split.

min_info_gain Minimum information gain for a split to be considered at a tree node. Should be >= 0, defaults to 0.

impurity Criterion used for information gain calculation. Supported: "entropy" and "gini" (default) for classification and "variance" (default) for regression. For ml_decision_tree, setting "auto" will default to the appropriate criterion based on model type.

seed Seed for random numbers.

thresholds Thresholds in multi-class classification to adjust the probability of predicting each class. Array must have length equal to the number of classes, with values > 0 excepting that at most one value may be 0. The class with largest value p/t is predicted, where p is the original probability of that class and t is the class’s threshold.
cache_node_ids  If FALSE, the algorithm will pass trees to executors to match instances with
nodes. If TRUE, the algorithm will cache node IDs for each instance. Caching
can speed up training of deeper trees. Defaults to FALSE.

checkpoint_interval  
Set checkpoint interval (>= 1) or disable checkpoint (-1). E.g. 10 means that the
cache will get checkpointed every 10 iterations, defaults to 10.

max_memory_in_mb  
Maximum memory in MB allocated to histogram aggregation. If too small,
then 1 node will be split per iteration, and its aggregates may exceed this size.
Defaults to 256.

features_col  Features column name, as a length-one character vector. The column should
be single vector column of numeric values. Usually this column is output by
ft_r_formula.

label_col  Label column name. The column should be a numeric column. Usually this
column is output by ft_r_formula.

prediction_col  Prediction column name.

probability_col  Column name for predicted class conditional probabilities.

raw_prediction_col  Raw prediction (a.k.a. confidence) column name.

uid  A character string used to uniquely identify the ML estimator.

...  Optional arguments; see Details.

type  The type of model to fit. "regression" treats the response as a continuous
variable, while "classification" treats the response as a categorical variable.
When "auto" is used, the model type is inferred based on the response variable
- if it is a numeric type, then regression is used; classification otherwise.

variance_col  (Optional) Column name for the biased sample variance of prediction.

response  (Deprecated) The name of the response column (as a length-one character vec-
tor.)

features  (Deprecated) The name of features (terms) to use for the model fit.

Details
When x is a tbl_spark and formula (alternatively, response and features) is specified, the func-
tion returns a ml_model object wrapping a ml_pipeline_model which contains data pre-processing
transformers, the ML predictor, and, for classification models, a post-processing transformer that
converts predictions into class labels. For classification, an optional argument predicted_label_col
(defaults to "predicted_label") can be used to specify the name of the predicted label column.
In addition to the fitted ml_pipeline_model, ml_model objects also contain a ml_pipeline object
where the ML predictor stage is an estimator ready to be fit against data. This is utilized by ml_save
with type = "pipeline" to facilitate model refresh workflows.

ml_decision_tree is a wrapper around ml_decision_tree_regressor.tbl_spark and ml_decision_tree_classifier
and calls the appropriate method based on model type.
The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a `spark_connection`, the function returns an instance of a `ml_estimator` object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.

- **ml_pipeline**: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the predictor appended to the pipeline.

- **tbl_spark**: When `x` is a `tbl_spark`, a predictor is constructed then immediately fit with the input `tbl_spark`, returning a prediction model.

- **tbl_spark, with formula specified**: When formula is specified, the input `tbl_spark` is first transformed using a `RFormula` transformer before being fit by the predictor. The object returned in this case is a `ml_model` which is a wrapper of a `ml_pipeline_model`.

**See Also**

See [https://spark.apache.org/docs/latest/ml-classification-regression.html](https://spark.apache.org/docs/latest/ml-classification-regression.html) for more information on the set of supervised learning algorithms.

Other ml algorithms: `ml_aft_survival_regression()`, `ml_gbt_classifier()`, `ml_generalized_linear_regression()`, `ml_isotonic_regression()`, `ml_linear_regression()`, `ml_linear_svc()`, `ml_logistic_regression()`, `ml_multilayer_perceptron_classifier()`, `ml_naive_bayes()`, `ml_one_vs_rest()`, `ml_random_forest_classifier()`.

**Examples**

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

dt_model <- iris_training %>%
  ml_decision_tree(Species ~ .)
pred <- ml_predict(dt_model, iris_test)
ml_multiclass_classification_evaluator(pred)
## End(Not run)
```
ml_default_stop_words  Default stop words

Description

Loads the default stop words for the given language.

Usage

ml_default_stop_words(
  sc,
  language = c("english", "danish", "dutch", "finnish", "french", "german", "hungarian",
               "italian", "norwegian", "portuguese", "russian", "spanish", "swedish", "turkish"),
  ...
)

Arguments

sc A spark_connection
language A character string.
... Optional arguments; currently unused.

Details

Supported languages: danish, dutch, english, finnish, french, german, hungarian, italian, norwegian, portuguese, russian, spanish, swedish, turkish. Defaults to English. See https://anoncvs.postgresql.org/cvsweb.cgi/pgsql/src/backend/snowball/stopwords/ for more details

Value

A list of stop words.

See Also

ft_stop_words_remover
ml_evaluate  

Evaluate the Model on a Validation Set

Description
Compute performance metrics.

Usage
ml_evaluate(x, dataset)

## S3 method for class 'ml_model_logistic_regression'
ml_evaluate(x, dataset)

## S3 method for class 'ml_logistic_regression_model'
ml_evaluate(x, dataset)

## S3 method for class 'ml_model_linear_regression'
ml_evaluate(x, dataset)

## S3 method for class 'ml_linear_regression_model'
ml_evaluate(x, dataset)

## S3 method for class 'ml_model_generalized_linear_regression'
ml_evaluate(x, dataset)

## S3 method for class 'ml_generalized_linear_regression_model'
ml_evaluate(x, dataset)

## S3 method for class 'ml_model_clustering'
ml_evaluate(x, dataset)

## S3 method for class 'ml_model_classification'
ml_evaluate(x, dataset)

## S3 method for class 'ml_evaluator'
ml_evaluate(x, dataset)

Arguments

- x: An ML model object or an evaluator object.
- dataset: The dataset to be validate the model on.

Examples
## Not run:
sc <- spark_connect(master = "local")
ml_evaluator <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

ml_gaussian_mixture(iris_tbl, Species ~ .) %>%
  ml_evaluate(iris_tbl)

ml_kmeans(iris_tbl, Species ~ .) %>%
  ml_evaluate(iris_tbl)

ml_bisecting_kmeans(iris_tbl, Species ~ .) %>%
  ml_evaluate(iris_tbl)

## End(Not run)

---

**ml_evaluator**

*Spark ML - Evaluators*

---

**Description**

A set of functions to calculate performance metrics for prediction models. Also see the Spark ML Documentation [https://spark.apache.org/docs/latest/api/scala/index.html#org.apache.spark.ml.evaluation.package](https://spark.apache.org/docs/latest/api/scala/index.html#org.apache.spark.ml.evaluation.package)

**Usage**

```r
ml_binary_classification_evaluator(
  x,
  label_col = "label",
  raw_prediction_col = "rawPrediction",
  metric_name = "areaUnderROC",
  uid = random_string("binary_classification_evaluator_"),
  ...
)
```

```r
ml_binary_classification_eval(
  x,
  label_col = "label",
  prediction_col = "prediction",
  metric_name = "areaUnderROC"
)
```

```r
ml_multiclass_classification_evaluator(
  x,
  label_col = "label",
  prediction_col = "prediction",
  metric_name = "f1",
  uid = random_string("multiclass_classification_evaluator_"),
  ...
)
```
ml_classification_eval(
    x,
    label_col = "label",
    prediction_col = "prediction",
    metric_name = "f1"
)

ml_regression_evaluator(
    x,
    label_col = "label",
    prediction_col = "prediction",
    metric_name = "rmse",
    uid = random_string("regression_evaluator_"),
    ...
)

Arguments

x          A spark_connection object or a tbl_spark containing label and prediction columns. The latter should be the output of sdf_predict.
label_col  Name of column string specifying which column contains the true labels or values.
raw_prediction_col  Raw prediction (a.k.a. confidence) column name.
metric_name  The performance metric. See details.
uid          A character string used to uniquely identify the ML estimator.
...           Optional arguments; currently unused.
prediction_col  Name of the column that contains the predicted label or value NOT the scored probability. Column should be of type Double.

Details

The following metrics are supported

- Binary Classification: areaUnderROC (default) or areaUnderPR (not available in Spark 2.X.)
- Multiclass Classification: f1 (default), precision, recall, weightedPrecision, weightedRecall or accuracy; for Spark 2.X: f1 (default), weightedPrecision, weightedRecall or accuracy.
- Regression: rmse (root mean squared error, default), mse (mean squared error), r2, or mae (mean absolute error.)

ml_binary_classification_eval() is an alias for ml_binary_classification_evaluator() for backwards compatibility.

ml_classification_eval() is an alias for ml_multiclass_classification_evaluator() for backwards compatibility.
Spark ML - Feature Importance for Tree Models

### Description

Spark ML - Feature Importance for Tree Models
ml_fpgrowth

Usage

ml_feature_importances(model, ...)

ml_tree_feature_importance(model, ...)

Arguments

model A decision tree-based model.

... Optional arguments; currently unused.

Value

For ml_model, a sorted data frame with feature labels and their relative importance. For ml_prediction_model, a vector of relative importances.

Description

A parallel FP-growth algorithm to mine frequent itemsets.

Usage

ml_fpgrowth(
  x
  ,
  items_col = "items",
  min_confidence = 0.8,
  min_support = 0.3,
  prediction_col = "prediction",
  uid = random_string("fpgrowth_"),
  ...
)

ml_association_rules(model)

ml_freq_itemsets(model)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.

items_col Items column name. Default: "items"

min_confidence Minimal confidence for generating Association Rule. min_confidence will not affect the mining for frequent itemsets, but will affect the association rules generation. Default: 0.8
**Description**

This class performs expectation maximization for multivariate Gaussian Mixture Models (GMMs). A GMM represents a composite distribution of independent Gaussian distributions with associated "mixing" weights specifying each's contribution to the composite. Given a set of sample points, this class will maximize the log-likelihood for a mixture of k Gaussians, iterating until the log-likelihood changes by less than \( \text{tol} \), or until it has reached the max number of iterations. While this process is generally guaranteed to converge, it is not guaranteed to find a global optimum.

**Usage**

```r
ml_gaussian_mixture(
  x,
  formula = NULL,
  k = 2,
  max_iter = 100,
  tol = 0.01,
  seed = NULL,
  features_col = "features",
  prediction_col = "prediction",
  probability_col = "probability",
  uid = random_string("gaussian_mixture_"),
  ...
)
```

**Arguments**

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **formula**: Used when `x` is a `tbl_spark`. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see `ft_r_formula` for details.
- **k**: The number of clusters to create.
- **max_iter**: The maximum number of iterations to use.
- **tol**: Param for the convergence tolerance for iterative algorithms.
ml_gaussian_mixture

seed
A random seed. Set this value if you need your results to be reproducible across repeated calls.

features_col
Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.

prediction_col
Prediction column name.

probability_col
Column name for predicted class conditional probabilities. Note: Not all models output well-calibrated probability estimates! These probabilities should be treated as confidences, not precise probabilities.

uid
A character string used to uniquely identify the ML estimator.

... Optional arguments, see Details.

Value
The object returned depends on the class of x.

- `spark_connection`: When x is a `spark_connection`, the function returns an instance of a `ml_estimator` object. The object contains a pointer to a Spark Estimator object and can be used to compose Pipeline objects.
- `ml_pipeline`: When x is a `ml_pipeline`, the function returns a `ml_pipeline` with the clustering estimator appended to the pipeline.
- `tbl_spark`: When x is a `tbl_spark`, an estimator is constructed then immediately fit with the input `tbl_spark`, returning a clustering model.
- `tbl_spark`, with formula or features specified: When formula is specified, the input `tbl_spark` is first transformed using a RFormula transformer before being fit by the estimator. The object returned in this case is a `ml_model` which is a wrapper of a `ml_pipeline_model`. This signature does not apply to `ml_lda()`.

See Also
See [https://spark.apache.org/docs/latest/ml-clustering.html](https://spark.apache.org/docs/latest/ml-clustering.html) for more information on the set of clustering algorithms.

Other ml clustering algorithms: `ml_bisecting_kmeans()`, `ml_kmeans()`, `ml_lda()`

Examples
```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

gmm_model <- ml_gaussian_mixture(iris_tbl, Species ~ .)
pred <- sdf_predict(iris_tbl, gmm_model)
ml_clustering_evaluator(pred)

## End(Not run)
```
Description

Perform binary classification and regression using gradient boosted trees. Multiclass classification is not supported yet.

Usage

```r
ml_gbt_classifier(
  x,
  formula = NULL,
  max_iter = 20,
  max_depth = 5,
  step_size = 0.1,
  subsampling_rate = 1,
  feature_subset_strategy = "auto",
  min_instances_per_node = 1L,
  max_bins = 32,
  min_info_gain = 0,
  loss_type = "logistic",
  seed = NULL,
  thresholds = NULL,
  checkpoint_interval = 10,
  cache_node_ids = FALSE,
  max_memory_in_mb = 256,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  uid = random_string("gbt_classifier_"),
  ...
)
```

```r
ml_gradient_boosted_trees(
  x,
  formula = NULL,
  type = c("auto", "regression", "classification"),
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  checkpoint_interval = 10,
  loss_type = c("auto", "logistic", "squared", "absolute"),
  ...
ml_gbt_classifier

max_bins = 32,
max_depth = 5,
max_iter = 20L,
min_info_gain = 0,
min_instances_per_node = 1,
step_size = 0.1,
subsampling_rate = 1,
feature_subset_strategy = "auto",
seed = NULL,
thresholds = NULL,
cache_node_ids = FALSE,
max_memory_in_mb = 256,
uid = random_string("gradient_boosted_trees_"),
response = NULL,
features = NULL,
...
)

ml_gbt_regressor(
  x,
  formula = NULL,
  max_iter = 20,
  max_depth = 5,
  step_size = 0.1,
  subsampling_rate = 1,
  feature_subset_strategy = "auto",
  min_instances_per_node = 1,
  max_bins = 32,
  min_info_gain = 0,
  loss_type = "squared",
  seed = NULL,
  checkpoint_interval = 10,
  cache_node_ids = FALSE,
  max_memory_in_mb = 256,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  uid = random_string("gbt_regressor_"),
  ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.
max_iter Maximum number of iterations.
**ml_gbt_classifier**

- **max_depth**: Maximum depth of the tree (>= 0); that is, the maximum number of nodes separating any leaves from the root of the tree.
- **step_size**: Step size (a.k.a. learning rate) in interval (0, 1] for shrinking the contribution of each estimator. (default = 0.1)
- **subsampling_rate**: Fraction of the training data used for learning each decision tree, in range (0, 1]. (default = 1.0)
- **feature_subset_strategy**: The number of features to consider for splits at each tree node. See details for options.
- **min_instances_per_node**: Minimum number of instances each child must have after split.
- **max_bins**: The maximum number of bins used for discretizing continuous features and for choosing how to split on features at each node. More bins give higher granularity.
- **min_info_gain**: Minimum information gain for a split to be considered at a tree node. Should be >= 0, defaults to 0.
- **loss_type**: Loss function which GBT tries to minimize. Supported: "squared" (L2) and "absolute" (L1) (default = squared) for regression and "logistic" (default) for classification. For ml_gradient_boosted_trees, setting "auto" will default to the appropriate loss type based on model type.
- **seed**: Seed for random numbers.
- **thresholds**: Thresholds in multi-class classification to adjust the probability of predicting each class. Array must have length equal to the number of classes, with values > 0 excepting that at most one value may be 0. The class with largest value p/t is predicted, where p is the original probability of that class and t is the class's threshold.
- **checkpoint_interval**: Set checkpoint interval (>= 1) or disable checkpoint (-1). E.g. 10 means that the cache will get checkpointed every 10 iterations, defaults to 10.
- **cache_node_ids**: If FALSE, the algorithm will pass trees to executors to match instances with nodes. If TRUE, the algorithm will cache node IDs for each instance. Caching can speed up training of deeper trees. Defaults to FALSE.
- **max_memory_in_mb**: Maximum memory in MB allocated to histogram aggregation. If too small, then 1 node will be split per iteration, and its aggregates may exceed this size. Defaults to 256.
- **features_col**: Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by ft_r_formula.
- **label_col**: Label column name. The column should be a numeric column. Usually this column is output by ft_r_formula.
- **prediction_col**: Prediction column name.
- **probability_col**: Column name for predicted class conditional probabilities.
raw_prediction_col
Raw prediction (a.k.a. confidence) column name.

uid
A character string used to uniquely identify the ML estimator.

... Optional arguments; see Details.

type
The type of model to fit. "regression" treats the response as a continuous variable, while "classification" treats the response as a categorical variable. When "auto" is used, the model type is inferred based on the response variable type – if it is a numeric type, then regression is used; classification otherwise.

response
(Deprecated) The name of the response column (as a length-one character vector).

features
(Deprecated) The name of features (terms) to use for the model fit.

Details

When x is a tbl_spark and formula (alternatively, response and features) is specified, the function returns a ml_model object wrapping a ml_pipeline_model which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument predicted_label_col (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted ml_pipeline_model, ml_model objects also contain a ml_pipeline object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by ml_save with type = "pipeline" to facilitate model refresh workflows.

The supported options for feature_subset_strategy are

• "auto": Choose automatically for task: If num_trees == 1, set to "all". If num_trees > 1 (forest), set to "sqrt" for classification and to "onethird" for regression.
• "all": use all features
• "onethird": use 1/3 of the features
• "sqrt": use use sqrt(number of features)
• "log2": use log2(number of features)
• "n": when n is in the range (0, 1.0[, use n * number of features. When n is in the range (1, number of features), use n features. (default = "auto")

ml_gradient_boosted_trees is a wrapper around ml_gbt_regressor.tbl_spark and ml_gbt_classifier.tbl_spark and calls the appropriate method based on model type.

Value

The object returned depends on the class of x.

• spark_connection: When x is a spark_connection, the function returns an instance of a ml_estimator object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
• ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the predictor appended to the pipeline.
• tbl_spark: When x is a tbl_spark, a predictor is constructed then immediately fit with the input tbl_spark, returning a prediction model.

• tbl_spark, with formula specified: When formula is specified, the input tbl_spark is first transformed using a RFormula transformer before being fit by the predictor. The object returned in this case is a ml_model which is a wrapper of a ml_pipeline_model.

See Also
See https://spark.apache.org/docs/latest/ml-classification-regression.html for more information on the set of supervised learning algorithms.

Other ml algorithms: ml_aft_survival_regression(), ml_decision_tree_classifier(), ml_generalized_linear_regression(), ml_isotonic_regression(), ml_linear_regression(), ml_linear_svc(), ml_logistic_regression(), ml_multilayer_perceptron_classifier(), ml_naive_bayes(), ml_one_vs_rest(), ml_random_forest_classifier()

Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

gbt_model <- iris_training %>%
  ml_gradient_boosted_trees(Sepal_Length ~ Petal_Length + Petal_Width)

pred <- ml_predict(gbt_model, iris_test)

ml_regression_evaluator(pred, label_col = "Sepal_Length")

## End(Not run)
```

Description

Perform regression using Generalized Linear Model (GLM).
Usage

```r
ml_generalized_linear_regression(
  x,
  formula = NULL,
  family = "gaussian",
  link = NULL,
  fit_intercept = TRUE,
  offset_col = NULL,
  link_power = NULL,
  link_prediction_col = NULL,
  reg_param = 0,
  max_iter = 25,
  weight_col = NULL,
  solver = "irls",
  tol = 1e-06,
  variance_power = 0,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  uid = random_string("generalized_linear_regression_"),
  ...
)
```

Arguments

- `x`: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `formula`: Used when `x` is a `tbl_spark`. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see `ft_r_formula` for details.
- `family`: Name of family which is a description of the error distribution to be used in the model. Supported options: "gaussian", "binomial", "poisson", "gamma" and "tweedie". Default is "gaussian".
- `link`: Name of link function which provides the relationship between the linear predictor and the mean of the distribution function. See for supported link functions.
- `fit_intercept`: Boolean; should the model be fit with an intercept term?
- `offset_col`: Offset column name. If this is not set, we treat all instance offsets as 0.0. The feature specified as offset has a constant coefficient of 1.0.
- `link_power`: Index in the power link function. Only applicable to the Tweedie family. Note that link power 0, 1, -1 or 0.5 corresponds to the Log, Identity, Inverse or Sqrt link, respectively. When not set, this value defaults to `1 - variance_power`, which matches the R "statmod" package.
- `link_prediction_col`: Link prediction (linear predictor) column name. Default is not set, which means we do not output link prediction.
- `reg_param`: Regularization parameter (aka lambda)
- `max_iter`: The maximum number of iterations to use.
weight_col  The name of the column to use as weights for the model fit.
solver     Solver algorithm for optimization.
tol        Param for the convergence tolerance for iterative algorithms.
variance_power  Power in the variance function of the Tweedie distribution which provides the relationship between the variance and mean of the distribution. Only applicable to the Tweedie family. (see Tweedie Distribution (Wikipedia)) Supported values: 0 and [1, Inf). Note that variance power 0, 1, or 2 corresponds to the Gaussian, Poisson or Gamma family, respectively.
features_col Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.
label_col   Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.
prediction_col Prediction column name.
uid         A character string used to uniquely identify the ML estimator.
...
                Optional arguments; see Details.

Details
When `x` is a tbl_spark and formula (alternatively, response and features) is specified, the function returns a ml_model object wrapping a ml_pipeline_model which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument predicted_label_col (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted ml_pipeline_model, ml_model objects also contain a ml_pipeline object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by ml_save with type = "pipeline" to facilitate model refresh workflows.

Valid link functions for each family is listed below. The first link function of each family is the default one.

- gaussian: "identity", "log", "inverse"
- binomial: "logit", "probit", "loglog"
- poisson: "log", "identity", "sqrt"
- gamma: "inverse", "identity", "log"
- tweedie: power link function specified through link_power. The default link power in the tweedie family is 1 - variance_power.

Value
The object returned depends on the class of `x`.

- spark_connection: When `x` is a spark_connection, the function returns an instance of a ml_estimator object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- ml_pipeline: When `x` is a ml_pipeline, the function returns a ml_pipeline with the predictor appended to the pipeline.
• tbl_spark: When x is a tbl_spark, a predictor is constructed then immediately fit with the input tbl_spark, returning a prediction model.

• tbl_spark, with formula: specified When formula is specified, the input tbl_spark is first transformed using a RFormula transformer before being fit by the predictor. The object returned in this case is a ml_model which is a wrapper of a ml_pipeline_model.

See Also

See https://spark.apache.org/docs/latest/ml-classification-regression.html for more information on the set of supervised learning algorithms.

Other ml algorithms: ml_aft_survival_regression(), ml_decision_tree_classifier(), ml_gbt_classifier(), ml_isotonic_regression(), ml_linear_regression(), ml_linear_svc(), ml_logistic_regression(), ml_multilayer_perceptron_classifier(), ml_naive_bayes(), ml_one_vs_rest(), ml_random_forest_classifier()

Examples

## Not run:
library(sparklyr)

sc <- spark_connect(master = "local")
mtcars_tbl <- sdf_copy_to(sc, mtcars, name = "mtcars_tbl", overwrite = TRUE)

partitions <- mtcars_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

mtcars_training <- partitions$training
mtcars_test <- partitions$test

# Specify the grid
family <- c("gaussian", "gamma", "poisson")
link <- c("identity", "log")
family_link <- expand.grid(family = family, link = link, stringsAsFactors = FALSE)
family_link <- data.frame(family_link, rmse = 0)

# Train the models
for (i in seq_len(nrow(family_link))) {
  glm_model <- mtcars_training %>%
    ml_generalized_linear_regression(mpg ~ .,
      family = family_link[i, 1],
      link = family_link[i, 2]
    )

  pred <- ml_predict(glm_model, mtcars_test)
  family_link[i, 3] <- ml_regression_evaluator(pred, label_col = "mpg")
}

family_link

## End(Not run)
Tidying methods for Spark ML linear models

Description

These methods summarize the results of Spark ML models into tidy forms.

Usage

```r
## S3 method for class 'ml_model_generalized_linear_regression'
tidy(x, exponentiate = FALSE, ...)

## S3 method for class 'ml_model_linear_regression'
tidy(x, ...)

## S3 method for class 'ml_model_generalized_linear_regression'
augment(
  x,
  newdata = NULL,
  type.residuals = c("working", "deviance", "pearson", "response"),
  ...
)

## S3 method for class "_.ml_model_linear_regression"
augment(
  x,
  new_data = NULL,
  type.residuals = c("working", "deviance", "pearson", "response"),
  ...
)

## S3 method for class 'ml_model_linear_regression'
augment(
  x,
  newdata = NULL,
  type.residuals = c("working", "deviance", "pearson", "response"),
  ...
)

## S3 method for class 'ml_model_generalized_linear_regression'
glance(x, ...)

## S3 method for class 'ml_model_linear_regression'
glance(x, ...)
```

Arguments

- **x**: a Spark ML model.
For GLM, whether to exponentiate the coefficient estimates (typical for logistic regression.)

... extra arguments (not used.)

data a tbl_spark of new data to use for prediction.

type.residuals type of residuals, defaults to "working". Must be set to "working" when newdata is supplied.

newdata a tbl_spark of new data to use for prediction.

details

The residuals attached by augment are of type "working" by default, which is different from the default of "deviance" for residuals() or sdf_residuals().

---

ml_isotonic_regression

Spark ML – Isotonic Regression

Description

Currently implemented using parallelized pool adjacent violators algorithm. Only univariate (single feature) algorithm supported.

Usage

ml_isotonic_regression(
  x,
  formula = NULL,
  feature_index = 0,
  isotonic = TRUE,
  weight_col = NULL,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  uid = random_string("isotonic_regression_"),
  ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.
feature_index Index of the feature if features_col is a vector column (default: 0), no effect otherwise.
isotonic

Whether the output sequence should be isotonic/increasing (true) or antitonic/decreasing (false). Default: true

weight_col

The name of the column to use as weights for the model fit.

features_col

Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.

label_col

Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.

prediction_col

Prediction column name.

uid

A character string used to uniquely identify the ML estimator.

... Optional arguments; see Details.

Details

When `x` is a `tbl_spark` and `formula` (alternatively, `response` and `features`) is specified, the function returns a `ml_model` object wrapping a `ml_pipeline_model` which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument `predicted_label_col` (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted `ml_pipeline_model`, `ml_model` objects also contain a `ml_pipeline` object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by `ml_save` with type = "pipeline" to facilitate model refresh workflows.

Value

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns an instance of a `ml_estimator` object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- `ml_pipeline`: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the predictor appended to the pipeline.
- `tbl_spark`: When `x` is a `tbl_spark`, a predictor is constructed then immediately fit with the input `tbl_spark`, returning a prediction model.
- `tbl_spark`, with formula: specified When formula is specified, the input `tbl_spark` is first transformed using a RFormula transformer before being fit by the predictor. The object returned in this case is a `ml_model` which is a wrapper of a `ml_pipeline_model`.

See Also

See `https://spark.apache.org/docs/latest/ml-classification-regression.html` for more information on the set of supervised learning algorithms.

Other ml algorithms: `ml_aft_survival_regression()`, `ml_decision_tree_classifier()`, `ml_gbt_classifier()`, `ml_generalized_linear_regression()`, `ml_linear_regression()`, `ml_linear_svc()`, `ml_logistic_regression()`, `ml_multilayer_perceptron_classifier()`, `ml_naive_bayes()`, `ml_one_vs_rest()`, `ml_random_forest_classifier()`.
Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

iso_res <- iris_tbl %>%
  ml_isotonic_regression(Petal_Length ~ Petal_Width)

pred <- ml_predict(iso_res, iris_test)
pred

## End(Not run)
```

---

**ml_isotonic_regression_tidiers**

Tidying methods for Spark ML Isotonic Regression

---

**Description**

These methods summarize the results of Spark ML models into tidy forms.

**Usage**

```r
## S3 method for class 'ml_model_isotonic_regression'
tidy(x, ...)

## S3 method for class 'ml_model_isotonic_regression'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_isotonic_regression'
glance(x, ...)
```

**Arguments**

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.
Description

K-means clustering with support for k-means|| initialization proposed by Bahmani et al. Using ‘ml_kmeans()’ with the formula interface requires Spark 2.0+.

Usage

ml_kmeans(
    x,
    formula = NULL,
    k = 2,
    max_iter = 20,
    tol = 1e-04,
    init_steps = 2,
    init_mode = "k-means||",
    seed = NULL,
    features_col = "features",
    prediction_col = "prediction",
    uid = random_string("kmeans_"),
    ...
)

ml_compute_cost(model, dataset)

ml_compute_silhouette_measure(
    model,
    dataset,
    distance_measure = c("squaredEuclidean", "cosine")
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.
k The number of clusters to create
max_iter The maximum number of iterations to use.
tol Param for the convergence tolerance for iterative algorithms.
init_steps Number of steps for the k-means|| initialization mode. This is an advanced setting – the default of 2 is almost always enough. Must be > 0. Default: 2.
**init_mode**  Initialization algorithm. This can be either "random" to choose random points as initial cluster centers, or "k-means||" to use a parallel variant of k-means++ (Bahmani et al., Scalable K-Means++, VLDB 2012). Default: k-means||.

**seed**  A random seed. Set this value if you need your results to be reproducible across repeated calls.

**features_col**  Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.

**prediction_col**  Prediction column name.

**uid**  A character string used to uniquely identify the ML estimator.

**...**  Optional arguments, see Details.

**model**  A fitted K-means model returned by `ml_kmeans()`

**dataset**  Dataset on which to calculate K-means cost

**distance_measure**  Distance measure to apply when computing the Silhouette measure.

### Value

The object returned depends on the class of `x`.

- **spark_connection**: When `x` is a `spark_connection`, the function returns an instance of a `ml_estimator` object. The object contains a pointer to a Spark Estimator object and can be used to compose Pipeline objects.

- **ml_pipeline**: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the clustering estimator appended to the pipeline.

- **tbl_spark**: When `x` is a `tbl_spark`, an estimator is constructed then immediately fit with the input `tbl_spark`, returning a clustering model.

- **tbl_spark, with formula or features specified**: When formula is specified, the input `tbl_spark` is first transformed using a `RFormula` transformer before being fit by the estimator. The object returned in this case is a `ml_model` which is a wrapper of a `ml_pipeline_model`. This signature does not apply to `ml_lda()`.

`ml_compute_cost()` returns the K-means cost (sum of squared distances of points to their nearest center) for the model on the given data.

`ml_compute_silhouette_measure()` returns the Silhouette measure of the clustering on the given data.

### See Also

See [https://spark.apache.org/docs/latest/ml-clustering.html](https://spark.apache.org/docs/latest/ml-clustering.html) for more information on the set of clustering algorithms.

Other ml clustering algorithms: `ml_bisecting_kmeans()`, `ml_gaussian_mixture()`, `ml_lda()`
Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)
ml_kmeans(iris_tbl, Species ~ .)
## End(Not run)
```

---

**ml_kmeans_cluster_eval**

*Evaluate a K-mean clustering*

**Description**

Evaluate a K-mean clustering

**Arguments**

- `model`: A fitted K-means model returned by `ml_kmeans()`
- `dataset`: Dataset on which to calculate K-means cost

---

**ml_lda**

*Spark ML – Latent Dirichlet Allocation*

**Description**

Latent Dirichlet Allocation (LDA), a topic model designed for text documents.

**Usage**

```r
ml_lda(
  x,
  formula = NULL,
  k = 10,
  max_iter = 20,
  doc_concentration = NULL,
  topic_concentration = NULL,
  subsampling_rate = 0.05,
  optimizer = "online",
  checkpoint_interval = 10,
  keep_last_checkpoint = TRUE,
  learning_decay = 0.51,
  learning_offset = 1024,
  optimize_doc_concentration = TRUE,
)```
seed = NULL,
features_col = "features",
topic_distribution_col = "topicDistribution",
uid = random_string("lda_"),
...
)

ml_describe_topics(model, max_terms_per_topic = 10)

ml_log_likelihood(model, dataset)

ml_log_perplexity(model, dataset)

ml_topics_matrix(model)

**Arguments**

- **x**
  A spark_connection, ml_pipeline, or a tbl_spark.

- **formula**
  Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see `ft_r_formula` for details.

- **k**
  The number of clusters to create

- **max_iter**
  The maximum number of iterations to use.

- **doc_concentration**
  Concentration parameter (commonly named "alpha") for the prior placed on documents' distributions over topics ("theta"). See details.

- **topic_concentration**
  Concentration parameter (commonly named "beta" or "eta") for the prior placed on topics' distributions over terms.

- **subsampling_rate**
  (For Online optimizer only) Fraction of the corpus to be sampled and used in each iteration of mini-batch gradient descent, in range (0, 1]. Note that this should be adjusted in sync with `max_iter` so the entire corpus is used. Specifically, set both so that `maxIterations * miniBatchFraction` greater than or equal to 1.

- **optimizer**
  Optimizer or inference algorithm used to estimate the LDA model. Supported: "online" for Online Variational Bayes (default) and "em" for Expectation-Maximization.

- **checkpoint_interval**
  Set checkpoint interval (>= 1) or disable checkpoint (-1). E.g. 10 means that the cache will get checkpointed every 10 iterations, defaults to 10.

- **keep_last_checkpoint**
  (Spark 2.0.0+) (For EM optimizer only) If using checkpointing, this indicates whether to keep the last checkpoint. If `FALSE`, then the checkpoint will be deleted. Deleting the checkpoint can cause failures if a data partition is lost, so set this bit with care. Note that checkpoints will be cleaned up via reference counting, regardless.
learning_decay  (For Online optimizer only) Learning rate, set as an exponential decay rate. This should be between (0.5, 1.0] to guarantee asymptotic convergence. This is called "kappa" in the Online LDA paper (Hoffman et al., 2010). Default: 0.51, based on Hoffman et al.

learning_offset  (For Online optimizer only) A (positive) learning parameter that downweights early iterations. Larger values make early iterations count less. This is called "tau0" in the Online LDA paper (Hoffman et al., 2010) Default: 1024, following Hoffman et al.

optimize_doc_concentration  (For Online optimizer only) Indicates whether the doc_concentration (Dirichlet parameter for document-topic distribution) will be optimized during training. Setting this to true will make the model more expressive and fit the training data better. Default: FALSE

seed  A random seed. Set this value if you need your results to be reproducible across repeated calls.

features_col  Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by ft_r_formula.

topic_distribution_col  Output column with estimates of the topic mixture distribution for each document (often called "theta" in the literature). Returns a vector of zeros for an empty document.

uid  A character string used to uniquely identify the ML estimator.

...  Optional arguments, see Details.

model  A fitted LDA model returned by ml_lda().

max_terms_per_topic  Maximum number of terms to collect for each topic. Default value of 10.

dataset  test corpus to use for calculating log likelihood or log perplexity

Details

For ‘ml_lda.tbl_spark’ with the formula interface, you can specify named arguments in ‘...’ that will be passed ‘ft_regex_tokenizer()’, ‘ft_stop_words_remover()’, and ‘ft_count_vectorizer()’. For example, to increase the default ‘min_token_length’, you can use ‘ml_lda(dataset, ~ text, min_token_length = 4)’.

Terminology for LDA:

- "term" = "word": an element of the vocabulary
- "token": instance of a term appearing in a document
- "topic": multinomial distribution over terms representing some concept
- "document": one piece of text, corresponding to one row in the input data

Input data (features_col): LDA is given a collection of documents as input data, via the features_col parameter. Each document is specified as a Vector of length vocab_size, where each entry is the count for the corresponding term (word) in the document. Feature transformers such as ft_tokenizer and ft_count_vectorizer can be useful for converting text to word count vectors.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns an instance of a ml_estimator object. The object contains a pointer to a Spark Estimator object and can be used to compose Pipeline objects.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the clustering estimator appended to the pipeline.
- tbl_spark: When x is a tbl_spark, an estimator is constructed then immediately fit with the input tbl_spark, returning a clustering model.
- tbl_spark, with formula or features specified: When formula is specified, the input tbl_spark is first transformed using a RFormula transformer before being fit by the estimator. The object returned in this case is a ml_model which is a wrapper of a ml_pipeline_model. This signature does not apply to ml_1da().

ml_describe_topics returns a DataFrame with topics and their top-weighted terms.
ml_log_likelihood calculates a lower bound on the log likelihood of the entire corpus.

Parameter details

doc_concentration: This is the parameter to a Dirichlet distribution, where larger values mean more smoothing (more regularization). If not set by the user, then doc_concentration is set automatically. If set to singleton vector [alpha], then alpha is replicated to a vector of length k in fitting. Otherwise, the doc_concentration vector must be length k. (default = automatic)

Optimizer-specific parameter settings:
EM
- Currently only supports symmetric distributions, so all values in the vector should be the same.
- Values should be greater than 1.0
- default = uniformly (50 / k) + 1, where 50/k is common in LDA libraries and +1 follows from Asuncion et al. (2009), who recommend a +1 adjustment for EM.

Online
- Values should be greater than or equal to 0
- default = uniformly (1.0 / k), following the implementation from here

topic_concentration:
This is the parameter to a symmetric Dirichlet distribution.
Note: The topics’ distributions over terms are called “beta” in the original LDA paper by Blei et al., but are called “phi” in many later papers such as Asuncion et al., 2009.
If not set by the user, then topic_concentration is set automatically. (default = automatic)

Optimizer-specific parameter settings:
EM
• Value should be greater than 1.0
• default = 0.1 + 1, where 0.1 gives a small amount of smoothing and +1 follows Asuncion et al. (2009), who recommend a +1 adjustment for EM.

Online
• Value should be greater than or equal to 0
• default = (1.0 / k), following the implementation from here.

**topic_distribution_col**: This uses a variational approximation following Hoffman et al. (2010), where the approximate distribution is called "gamma." Technically, this method returns this approximation "gamma" for each document.

### See Also

See [https://spark.apache.org/docs/latest/ml-clustering.html](https://spark.apache.org/docs/latest/ml-clustering.html) for more information on the set of clustering algorithms.

Other ml clustering algorithms: `ml_bisecting_kmeans()`, `ml_gaussian_mixture()`, `ml_kmeans()`

### Examples

```r
## Not run:
library(janeaustenr)
library(dplyr)
sc <- spark_connect(master = "local")

lines_tbl <- sdf_copy_to(sc,
  austen_books()[c(1:30), ],
  name = "lines_tbl",
  overwrite = TRUE
)

# transform the data in a tidy form
lines_tbl_tidy <- lines_tbl %>%
  ft_tokenizer(
    input_col = "text",
    output_col = "word_list"
  ) %>%
  ft_stop_words_remover(
    input_col = "word_list",
    output_col = "wo_stop_words"
  ) %>%
  mutate(text = explode(wo_stop_words)) %>%
  filter(text != "") %>%
  select(text, book)

lda_model <- lines_tbl_tidy %>%
  ml_lda(~text, k = 4)

# vocabulary and topics
tidy(lda_model)
```
ml_lda_tidiers  
*Tidying methods for Spark ML LDA models*

**Description**

These methods summarize the results of Spark ML models into tidy forms.

**Usage**

```r
## S3 method for class 'ml_model' tidier
tidy(x, ...)
## S3 method for class 'ml_model_lda'
augment(x, newdata = NULL, ...)
## S3 method for class 'ml_model_lda'
gleance(x, ...)
```

**Arguments**

- `x`  
a Spark ML model.
- `...`  
extra arguments (not used.)
- `newdata`  
a tbl_spark of new data to use for prediction.

---

**ml_linear_regression  
Spark ML – Linear Regression**

**Description**

Perform regression using linear regression.

**Usage**

```r
ml_linear_regression(
  x,
  formula = NULL,
  fit_intercept = TRUE,
  elastic_net_param = 0,
  reg_param = 0,
  max_iter = 100,
  weight_col = NULL,
  loss = "squaredError",
```
ml_linear_regression

```r
solver = "auto",
standardization = TRUE,
tol = 1e-06,
features_col = "features",
label_col = "label",
prediction_col = "prediction",
uid = random_string("linear_regression_"),
...
)
```

Arguments

- **x**
  - A spark_connection, ml_pipeline, or a tbl_spark.
- **formula**
  - Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see `ft_r_formula` for details.
- **fit_intercept**
  - Boolean; should the model be fit with an intercept term?
- **elastic_net_param**
  - ElasticNet mixing parameter, in range [0, 1]. For alpha = 0, the penalty is an L2 penalty. For alpha = 1, it is an L1 penalty.
- **reg_param**
  - Regularization parameter (aka lambda)
- **max_iter**
  - The maximum number of iterations to use.
- **weight_col**
  - The name of the column to use as weights for the model fit.
- **loss**
  - The loss function to be optimized. Supported options: "squaredError" and "huber". Default: "squaredError"
- **solver**
  - Solver algorithm for optimization.
- **standardization**
  - Whether to standardize the training features before fitting the model.
- **tol**
  - Param for the convergence tolerance for iterative algorithms.
- **features_col**
  - Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.
- **label_col**
  - Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.
- **prediction_col**
  - Prediction column name.
- **uid**
  - A character string used to uniquely identify the ML estimator.
- **...**
  - Optional arguments; see Details.

Details

When `x` is a tbl_spark and formula (alternatively, response and features) is specified, the function returns a ml_model object wrapping a ml_pipeline_model which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument predicted_label_col
(defaults to "predicted_label") can be used to specify the name of the predicted label column.
In addition to the fitted ml_pipeline_model, ml_model objects also contain a ml_pipeline object
where the ML predictor stage is an estimator ready to be fit against data. This is utilized by ml_save
with type = "pipeline" to facilitate model refresh workflows.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns an instance of a
  ml_estimator object. The object contains a pointer to a Spark Predictor object and can be
  used to compose Pipeline objects.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the pre-
  dictor appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a predictor is constructed then immediately fit with the
  input tbl_spark, returning a prediction model.
- tbl_spark, with formula: specified When formula is specified, the input tbl_spark is
  first transformed using a RFormula transformer before being fit by the predictor. The object
  returned in this case is a ml_model which is a wrapper of a ml_pipeline_model.

See Also

See https://spark.apache.org/docs/latest/ml-classification-regression.html for more
information on the set of supervised learning algorithms.

Other ml algorithms: ml_aft_survival_regression(), ml_decision_tree_classifier(), ml_gbt_classifier(),
ml_generalized_linear_regression(), ml_isotonic_regression(), ml_linear_svc(), ml_logistic_regression(),
ml_multilayer_perceptron_classifier(), ml_naive_bayes(), ml_one_vs_rest(), ml_random_forest_classifier

Examples

## Not run:
sc <- spark_connect(master = "local")
mtcars_tbl <- sdf_copy_to(sc, mtcars, name = "mtcars_tbl", overwrite = TRUE)

partitions <- mtcars_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

mtcars_training <- partitions$training
mtcars_test <- partitions$test

lm_model <- mtcars_training %>%
  ml_linear_regression(mpg ~ .)

pred <- ml_predict(lm_model, mtcars_test)

ml_regression_evaluator(pred, label_col = "mpg")

## End(Not run)
ml_linear_svc

Spark ML – LinearSVC

Description

Perform classification using linear support vector machines (SVM). This binary classifier optimizes the Hinge Loss using the OWLQN optimizer. Only supports L2 regularization currently.

Usage

ml_linear_svc(
  x,
  formula = NULL,
  fit_intercept = TRUE,
  reg_param = 0,
  max_iter = 100,
  standardization = TRUE,
  weight_col = NULL,
  tol = 1e-06,
  threshold = 0,
  aggregation_depth = 2,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  raw_prediction_col = "rawPrediction",
  uid = random_string("linear_svc_"),
  ...
)

Arguments

x  A spark_connection, ml_pipeline, or a tbl_spark.
formula  Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.
fit_intercept  Boolean; should the model be fit with an intercept term?
reg_param  Regularization parameter (aka lambda)
max_iter  The maximum number of iterations to use.
standardization  Whether to standardize the training features before fitting the model.
weight_col  The name of the column to use as weights for the model fit.
tol  Param for the convergence tolerance for iterative algorithms.
threshold  in binary classification prediction, in range [0, 1].
aggregation_depth  (Spark 2.1.0+) Suggested depth for treeAggregate (>= 2).
features_col Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by \texttt{ft_r_formula}.

label_col Label column name. The column should be a numeric column. Usually this column is output by \texttt{ft_r_formula}.

prediction_col Prediction column name.

raw_prediction_col Raw prediction (a.k.a. confidence) column name.

uid A character string used to uniquely identify the ML estimator.

Optional arguments; see Details.

Details

When \texttt{x} is a \texttt{tbl_spark} and \texttt{formula} (alternatively, \texttt{response} and \texttt{features}) is specified, the function returns a \texttt{ml_model} object wrapping a \texttt{ml_pipeline_model} which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument \texttt{predicted_label_col} (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted \texttt{ml_pipeline_model}, \texttt{ml_model} objects also contain a \texttt{ml_pipeline} object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by \texttt{ml_save} with \texttt{type = "pipeline"} to facilitate model refresh workflows.

Value

The object returned depends on the class of \texttt{x}.

- \texttt{spark_connection}: When \texttt{x} is a \texttt{spark_connection}, the function returns an instance of a \texttt{ml_estimator} object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- \texttt{ml_pipeline}: When \texttt{x} is a \texttt{ml_pipeline}, the function returns a \texttt{ml_pipeline} with the predictor appended to the pipeline.
- \texttt{tbl_spark}: When \texttt{x} is a \texttt{tbl_spark}, a predictor is constructed then immediately fit with the input \texttt{tbl_spark}, returning a prediction model.
- \texttt{tbl_spark}, with \texttt{formula} specified When \texttt{formula} is specified, the input \texttt{tbl_spark} is first transformed using a \texttt{RFormula} transformer before being fit by the predictor. The object returned in this case is a \texttt{ml_model} which is a wrapper of a \texttt{ml_pipeline_model}.

See Also

See \url{https://spark.apache.org/docs/latest/ml-classification-regression.html} for more information on the set of supervised learning algorithms.

Other ml algorithms: \texttt{ml_aft_survival_regression()}, \texttt{ml_decision_tree_classifier()}, \texttt{ml_gbt_classifier()}, \texttt{ml_generalized_linear_regression()}, \texttt{ml_isotonic_regression()}, \texttt{ml_linear_regression()}, \texttt{ml_logistic_regression()}, \texttt{ml_multilayer_perceptron_classifier()}, \texttt{ml_naive_bayes()}, \texttt{ml_one_vs_rest()}, \texttt{ml_random_forest_classifier()}

Examples

```r
# Not run:
library(dplyr)

sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  filter(Species != "setosa") %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

svc_model <- iris_training %>%
  ml_linear_svc(Species ~ .)

pred <- ml_predict(svc_model, iris_test)
ml_binary_classification_evaluator(pred)

# End(Not run)
```

Description

These methods summarize the results of Spark ML models into tidy forms.

Usage

```r
# S3 method for class 'ml_model_linear_svc'
tidy(x, ...)

# S3 method for class 'ml_model_linear_svc'
augment(x, newdata = NULL, ...)

# S3 method for class 'ml_model_linear_svc'
glance(x, ...)
```

Arguments

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.
ml_logistic_regression

Spark ML – Logistic Regression

Description

Perform classification using logistic regression.

Usage

ml_logistic_regression(
  x,
  formula = NULL,
  fit_intercept = TRUE,
  elastic_net_param = 0,
  reg_param = 0,
  max_iter = 100,
  threshold = 0.5,
  thresholds = NULL,
  tol = 1e-06,
  weight_col = NULL,
  aggregation_depth = 2,
  lower_bounds_on_coefficients = NULL,
  lower_bounds_on_intercepts = NULL,
  upper_bounds_on_coefficients = NULL,
  upper_bounds_on_intercepts = NULL,
  features_col = "features",
  label_col = "label",
  family = "auto",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  uid = random_string("logistic_regression_"),
  ...
)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.

formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.

fit_intercept Boolean; should the model be fit with an intercept term?

elastic_net_param ElasticNet mixing parameter, in range [0, 1]. For alpha = 0, the penalty is an L2 penalty. For alpha = 1, it is an L1 penalty.
### Logistic Regression Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>reg_param</code></td>
<td>Regularization parameter (aka lambda)</td>
</tr>
<tr>
<td><code>max_iter</code></td>
<td>The maximum number of iterations to use.</td>
</tr>
<tr>
<td><code>threshold</code></td>
<td>in binary classification prediction, in range [0, 1].</td>
</tr>
<tr>
<td><code>thresholds</code></td>
<td>Thresholds in multi-class classification to adjust the probability of predicting each class. Array must have length equal to the number of classes, with values &gt; 0 excepting that at most one value may be 0. The class with largest value $p/t$ is predicted, where $p$ is the original probability of that class and $t$ is the class’s threshold.</td>
</tr>
<tr>
<td><code>tol</code></td>
<td>Param for the convergence tolerance for iterative algorithms.</td>
</tr>
<tr>
<td><code>weight_col</code></td>
<td>The name of the column to use as weights for the model fit.</td>
</tr>
<tr>
<td><code>aggregation_depth</code></td>
<td>(Spark 2.1.0+) Suggested depth for treeAggregate (&gt;= 2).</td>
</tr>
<tr>
<td><code>lower_bounds_on_coefficients</code></td>
<td>(Spark 2.2.0+) Lower bounds on coefficients if fitting under bound constrained optimization. The bound matrix must be compatible with the shape (1, number of features) for binomial regression, or (number of classes, number of features) for multinomial regression.</td>
</tr>
<tr>
<td><code>lower_bounds_on_intercepts</code></td>
<td>(Spark 2.2.0+) Lower bounds on intercepts if fitting under bound constrained optimization. The bounds vector size must be equal with 1 for binomial regression, or the number of classes for multinomial regression.</td>
</tr>
<tr>
<td><code>upper_bounds_on_coefficients</code></td>
<td>(Spark 2.2.0+) Upper bounds on coefficients if fitting under bound constrained optimization. The bound matrix must be compatible with the shape (1, number of features) for binomial regression, or (number of classes, number of features) for multinomial regression.</td>
</tr>
<tr>
<td><code>upper_bounds_on_intercepts</code></td>
<td>(Spark 2.2.0+) Upper bounds on intercepts if fitting under bound constrained optimization. The bounds vector size must be equal with 1 for binomial regression, or the number of classes for multinomial regression.</td>
</tr>
<tr>
<td><code>features_col</code></td>
<td>Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by <code>ft_r_formula</code> .</td>
</tr>
<tr>
<td><code>label_col</code></td>
<td>Label column name. The column should be a numeric column. Usually this column is output by <code>ft_r_formula</code> .</td>
</tr>
<tr>
<td><code>family</code></td>
<td>(Spark 2.1.0+) Param for the name of family which is a description of the label distribution to be used in the model. Supported options: &quot;auto&quot;, &quot;binomial&quot;, and &quot;multinomial.&quot;</td>
</tr>
<tr>
<td><code>prediction_col</code></td>
<td>Prediction column name.</td>
</tr>
<tr>
<td><code>probability_col</code></td>
<td>Column name for predicted class conditional probabilities.</td>
</tr>
<tr>
<td><code>raw_prediction_col</code></td>
<td>Raw prediction (a.k.a. confidence) column name.</td>
</tr>
<tr>
<td><code>uid</code></td>
<td>A character string used to uniquely identify the ML estimator.</td>
</tr>
<tr>
<td>...</td>
<td>Optional arguments; see Details.</td>
</tr>
</tbody>
</table>
Details

When \( x \) is a \( \text{tbl\_spark} \) and \( \text{formula} \) (alternatively, \( \text{response} \) and \( \text{features} \)) is specified, the function returns a \( \text{ml\_model} \) object wrapping a \( \text{ml\_pipeline\_model} \) which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument \( \text{predicted\_label\_col} \) (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted \( \text{ml\_pipeline\_model} \), \( \text{ml\_model} \) objects also contain a \( \text{ml\_pipeline} \) object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by \( \text{ml\_save} \) with type = "pipeline" to facilitate model refresh workflows.

Value

The object returned depends on the class of \( x \).

- \( \text{spark\_connection} \): When \( x \) is a \( \text{spark\_connection} \), the function returns an instance of a \( \text{ml\_estimator} \) object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- \( \text{ml\_pipeline} \): When \( x \) is a \( \text{ml\_pipeline} \), the function returns a \( \text{ml\_pipeline} \) with the predictor appended to the pipeline.
- \( \text{tbl\_spark} \): When \( x \) is a \( \text{tbl\_spark} \), a predictor is constructed then immediately fit with the input \( \text{tbl\_spark} \), returning a prediction model.
- \( \text{tbl\_spark} \), with formula: specified When \( \text{formula} \) is specified, the input \( \text{tbl\_spark} \) is first transformed using a \( \text{RFormula} \) transformer before being fit by the predictor. The object returned in this case is a \( \text{ml\_model} \) which is a wrapper of a \( \text{ml\_pipeline\_model} \).

See Also

See [https://spark.apache.org/docs/latest/ml-classification-regression.html](https://spark.apache.org/docs/latest/ml-classification-regression.html) for more information on the set of supervised learning algorithms.

Other ml algorithms: \( \text{ml\_aft\_survival\_regression}() \), \( \text{ml\_decision\_tree\_classifier}() \), \( \text{ml\_gbt\_classifier}() \), \( \text{ml\_generalized\_linear\_regression}() \), \( \text{ml\_isotonic\_regression}() \), \( \text{ml\_linear\_regression}() \), \( \text{ml\_linear\_svc}() \), \( \text{ml\_multilayer\_perceptron\_classifier}() \), \( \text{ml\_naive\_bayes}() \), \( \text{ml\_one\_vs\_rest}() \), \( \text{ml\_random\_forest\_classifier}() \)

Examples

```r
## Not run:
sd <- spark_connect(master = "local")
mtcars_tbl <- sdf_copy_to(sc, mtcars, name = "mtcars_tbl", overwrite = TRUE)
partitions <- mtcars_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)
mtcars_training <- partitions$training
mtcars_test <- partitions$test
lr_model <- mtcars_training %>%
  ml_logistic_regression(am ~ gear + carb)
```
pred <- ml_predict(lr_model, mtcars_test)
ml_binary_classification_evaluator(pred)
## End(Not run)

---

**ml_logistic_regression_tidiers**

*Tidying methods for Spark ML Logistic Regression*

**Description**

These methods summarize the results of Spark ML models into tidy forms.

**Usage**

```r
## S3 method for class 'ml_model_logistic_regression'
tidy(x, ...)

## S3 method for class 'ml_model_logistic_regression'
augment(x, newdata = NULL, ...)

## S3 method for class `'ml_model_logistic_regression'``
augment(x, new_data = NULL, ...)

## S3 method for class 'ml_model_logistic_regression'
glance(x, ...)
```

**Arguments**

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.
- `new_data` a tbl_spark of new data to use for prediction.

---

**ml_metrics_binary**

*Extracts metrics from a fitted table*

**Description**

The function works best when passed a `tbl_spark` created by `ml_predict()`. The output `tbl_spark` will contain the correct variable types and format that the given Spark model "evaluator" expects.
ml_metrics_binary

Usage

ml_metrics_binary(  
  x,  
  truth = label,  
  estimate = rawPrediction,  
  metrics = c("roc_auc", "pr_auc"),  
  ...  
)

Arguments

x  
A ‘tbl_spark’ containing the estimate (prediction) and the truth (value of what actually happened)

truth  
The name of the column from ‘x’ with an integer field containing the binary response (0 or 1). The ‘ml_predict()’ function will create a new field named ‘label’ which contains the expected type and values. ‘truth’ defaults to ‘label’.

estimate  
The name of the column from ‘x’ that contains the prediction. Defaults to ‘rawPrediction’, since its type and expected values will match ‘truth’.

metrics  
A character vector with the metrics to calculate. For binary models the possible values are: ‘roc_auc’ (Area under the Receiver Operator curve), ‘pr_auc’ (Area under the Precision Recall curve). Defaults to: ‘roc_auc’, ‘pr_auc’

...  
Optional arguments; currently unused.

Details

The ‘ml_metrics’ family of functions implement Spark’s ‘evaluate’ closer to how the ‘yardstick’ package works. The functions expect a table containing the truth and estimate, and return a ‘tibble’ with the results. The ‘tibble’ has the same format and variable names as the output of the ‘yardstick’ functions.

Examples

```r
## Not run:
sc <- spark_connect("local")
tbl_iris <- copy_to(sc, iris)
prep_iris <- tbl_iris %>%
  mutate(is_setosa = ifelse(Species == "setosa", 1, 0))
iris_split <- sdf_random_split(prep_iris, training = 0.5, test = 0.5)
model <- ml_logistic_regression(iris_split$training, "is_setosa ~ Sepal_Length")
tbl_predictions <- ml_predict(model, iris_split$test)
ml_metrics_binary(tbl_predictions)

## End(Not run)
```
**ml_metrics_multiclass** Extracts metrics from a fitted table

**Description**

The function works best when passed a `tbl_spark` created by `ml_predict()`. The output `tbl_spark` will contain the correct variable types and format that the given Spark model "evaluator" expects.

**Usage**

```r
ml_metrics_multiclass(
  x,
  truth = label,
  estimate = prediction,
  metrics = c("accuracy"),
  beta = NULL,
  ...
)
```

**Arguments**

- **x**
  A `tbl_spark` containing the estimate (prediction) and the truth (value of what actually happened)

- **truth**
  The name of the column from `x` with an integer field containing an the indexed value for each outcome. The `ml_predict()` function will create a new field named 'label' which contains the expected type and values. 'truth' defaults to 'label'.

- **estimate**
  The name of the column from `x` that contains the prediction. Defaults to 'prediction', since its type and indexed values will match 'truth'.

- **metrics**
  A character vector with the metrics to calculate. For multiclass models the possible values are: 'accuracy', 'f_meas' (F-score), 'recall' and 'precision'. This function translates the argument into an acceptable Spark parameter. If no translation is found, then the raw value of the argument is passed to Spark. This makes it possible to request a metric that is not listed here but, depending on version, it is available in Spark. Other metrics form multi-class models are: 'weightedTruePositiveRate', 'weightedFalsePositiveRate', 'weightedFMeasure', 'truePositiveRateByLabel', 'falsePositiveRateByLabel', 'precisionByLabel', 'recallByLabel', 'fMeasureByLabel', 'logLoss', 'hammingLoss'

- **beta**
  Numerical value used for precision and recall. Defaults to NULL, but if the Spark session's version is 3.0 and above, then NULL is changed to 1, unless something different is supplied in this argument.

- **...**
  Optional arguments; currently unused.
Details

The ‘ml_metrics’ family of functions implement Spark’s ‘evaluate’ closer to how the ‘yardstick’ package works. The functions expect a table containing the truth and estimate, and return a ‘tibble’ with the results. The ‘tibble’ has the same format and variable names as the output of the ‘yardstick’ functions.

Examples

```r
## Not run:
sc <- spark_connect("local")
tbl_iris <- copy_to(sc, iris)
iris_split <- sdf_random_split(tbl_iris, training = 0.5, test = 0.5)
model <- ml_random_forest(iris_split$training, "Species ~ .")
tbl_predictions <- ml_predict(model, iris_split$test)

ml_metrics_multiclass(tbl_predictions)

# Request different metrics
ml_metrics_multiclass(tbl_predictions, metrics = c("recall", "precision"))

# Request metrics not translated by the function, but valid in Spark
ml_metrics_multiclass(tbl_predictions, metrics = c("logLoss", "hammingLoss"))

## End(Not run)
```

---

ml_metrics_regression  Extracts metrics from a fitted table

Description

The function works best when passed a ‘tbl_spark’ created by ‘ml_predict()’. The output ‘tbl_spark’ will contain the correct variable types and format that the given Spark model "evaluator" expects.

Usage

```r
ml_metrics_regression(
  x,
  truth,
  estimate = prediction,
  metrics = c("rmse", "rsq", "mae"),
  ...
)
```

Arguments

- `x` A ‘tbl_spark’ containing the estimate (prediction) and the truth (value of what actually happened)
truth
The name of the column from 'x' that contains the value of what actually happened

estimate
The name of the column from 'x' that contains the prediction. Defaults to 'prediction', since it is the default that 'ml_predict()' uses.

metrics
A character vector with the metrics to calculate. For regression models the possible values are: 'rmse' (Root mean squared error), 'mse' (Mean squared error), 'rsq' (R squared), 'mae' (Mean absolute error), and 'var' (Explained variance). Defaults to: 'rmse', 'rsq', 'mae'

... Optional arguments; currently unused.

Details
The 'ml_metrics' family of functions implement Spark's 'evaluate' closer to how the 'yardstick' package works. The functions expect a table containing the truth and estimate, and return a 'tibble' with the results. The 'tibble' has the same format and variable names as the output of the 'yardstick' functions.

Examples
```r
## Not run:
sc <- spark_connect("local")
tbl_iris <- copy_to(sc, iris)
iris_split <- sdf_random_split(tbl_iris, training = 0.5, test = 0.5)
training <- iris_split$training
reg_formula <- "Sepal_Length ~ Sepal_Width + Petal_Length + Petal_Width"
model <- ml_generalized_linear_regression(training, reg_formula)
tbl_predictions <- ml_predict(model, iris_split$test)
tbl_predictions %>%
  ml_metrics_regression(Sepal_Length)
## End(Not run)
```

ml_model_data
Extracts data associated with a Spark ML model

Description
Extracts data associated with a Spark ML model

Usage
ml_model_data(object)

Arguments

object a Spark ML model
**Value**

A tbl_spark

---

**ml_multilayer_perceptron_classifier**

*Spark ML – Multilayer Perceptron*

---

**Description**

Classification model based on the Multilayer Perceptron. Each layer has sigmoid activation function, output layer has softmax.

**Usage**

```r
ml_multilayer_perceptron_classifier(
  x,
  formula = NULL,
  layers = NULL,
  max_iter = 100,
  step_size = 0.03,
  tol = 1e-06,
  block_size = 128,
  solver = "l-bfgs",
  seed = NULL,
  initial_weights = NULL,
  thresholds = NULL,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  uid = random_string("multilayer_perceptron_classifier_"),
  ...)
```

```r
ml_multilayer_perceptron(
  x,
  formula = NULL,
  layers,
  max_iter = 100,
  step_size = 0.03,
  tol = 1e-06,
  block_size = 128,
  solver = "l-bfgs",
  seed = NULL,
  initial_weights = NULL,
```
features_col = "features",
label_col = "label",
thresholds = NULL,
prediction_col = "prediction",
probability_col = "probability",
raw_prediction_col = "rawPrediction",
uid = random_string("multilayer_perceptron_classifier_"),
response = NULL,
features = NULL,
...)

Arguments

x  A spark_connection, ml_pipeline, or a tbl_spark.

formula  Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.

layers  A numeric vector describing the layers – each element in the vector gives the size of a layer. For example, c(4, 5, 2) would imply three layers, with an input (feature) layer of size 4, an intermediate layer of size 5, and an output (class) layer of size 2.

max_iter  The maximum number of iterations to use.

step_size  Step size to be used for each iteration of optimization (> 0).

tol  Param for the convergence tolerance for iterative algorithms.

block_size  Block size for stacking input data in matrices to speed up the computation. Data is stacked within partitions. If block size is more than remaining data in a partition then it is adjusted to the size of this data. Recommended size is between 10 and 1000. Default: 128

solver  The solver algorithm for optimization. Supported options: "gd" (minibatch gradient descent) or "l-bfgs". Default: "l-bfgs"

seed  A random seed. Set this value if you need your results to be reproducible across repeated calls.

initial_weights  The initial weights of the model.

thresholds  Thresholds in multi-class classification to adjust the probability of predicting each class. Array must have length equal to the number of classes, with values > 0 excepting that at most one value may be 0. The class with largest value p/t is predicted, where p is the original probability of that class and t is the class’s threshold.

features_col  Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by ft_r_formula.

label_col  Label column name. The column should be a numeric column. Usually this column is output by ft_r_formula.
prediction_col  Prediction column name.
probability_col  Column name for predicted class conditional probabilities.
raw_prediction_col  Raw prediction (a.k.a. confidence) column name.
uid  A character string used to uniquely identify the ML estimator.
response  (Deprecated) The name of the response column (as a length-one character vector.)
features  (Deprecated) The name of features (terms) to use for the model fit.

**Details**

When `x` is a `tbl_spark` and `formula` (alternatively, `response` and `features`) is specified, the function returns a `ml_model` object wrapping a `ml_pipeline_model` which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument `predicted_label_col` (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted `ml_pipeline_model`, `ml_model` objects also contain a `ml_pipeline` object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by `ml_save` with `type = "pipeline"` to facilitate model refresh workflows.

`ml_multilayer_perceptron()` is an alias for `ml_multilayer_perceptron_classifier()` for backwards compatibility.

**Value**

The object returned depends on the class of `x`.

- `spark_connection`: When `x` is a `spark_connection`, the function returns an instance of a `ml_estimator` object. The object contains a pointer to a Spark `Predictor` object and can be used to compose Pipeline objects.
- `ml_pipeline`: When `x` is a `ml_pipeline`, the function returns a `ml_pipeline` with the predictor appended to the pipeline.
- `tbl_spark`: When `x` is a `tbl_spark`, a predictor is constructed then immediately fit with the input `tbl_spark`, returning a prediction model.
- `tbl_spark`, with `formula` specified: When `formula` is specified, the input `tbl_spark` is first transformed using a `RFormula` transformer before being fit by the predictor. The object returned in this case is a `ml_model` which is a wrapper of a `ml_pipeline_model`.

**See Also**

See [https://spark.apache.org/docs/latest/ml-classification-regression.html](https://spark.apache.org/docs/latest/ml-classification-regression.html) for more information on the set of supervised learning algorithms.

Other ml algorithms: `ml_aft_survival_regression()`, `ml_decision_tree_classifier()`, `ml_gbt_classifier()`, `ml_generalized_linear_regression()`, `ml_isotonic_regression()`, `ml_linear_regression()`, `ml_linear_svc()`, `ml_logistic_regression()`, `ml_naive_bayes()`, `ml_one_vs_rest()`, `ml_random_forest_classifier()`.
Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)
partitions <- iris_tbl %>%
sdf_random_split(training = 0.7, test = 0.3, seed = 1111)
iris_training <- partitions$training
iris_test <- partitions$test
mlp_model <- iris_training %>%
  ml_multilayer_perceptron_classifier(Species ~ ., layers = c(4, 3, 3))
pred <- ml_predict(mlp_model, iris_test)
ml_multiclass_classification_evaluator(pred)
## End(Not run)
```

### Description

These methods summarize the results of Spark ML models into tidy forms.

### Usage

```r
## S3 method for class 'ml_model_multilayer_perceptron_classification'
tidy(x, ...)
## S3 method for class 'ml_model_multilayer_perceptron_classification'
augment(x, newdata = NULL, ...)
## S3 method for class 'ml_model_multilayer_perceptron_classification'
glance(x, ...)
```

### Arguments

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.
Description

Naive Bayes Classifiers. It supports Multinomial NB (see here) which can handle finitely supported discrete data. For example, by converting documents into TF-IDF vectors, it can be used for document classification. By making every vector a binary (0/1) data, it can also be used as Bernoulli NB (see here). The input feature values must be nonnegative.

Usage

```r
ml_naive_bayes(
  x,
  formula = NULL,
  model_type = "multinomial",
  smoothing = 1,
  thresholds = NULL,
  weight_col = NULL,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  uid = random_string("naive_bayes_"),
  ...
)
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>A spark_connection, ml_pipeline, or a tbl_spark.</td>
</tr>
<tr>
<td>formula</td>
<td>Used when x is a tbl_spark. R formula as a character string or a formula.</td>
</tr>
<tr>
<td>model_type</td>
<td>The model type. Supported options: &quot;multinomial&quot; and &quot;bernoulli&quot;. (default = multinomial)</td>
</tr>
<tr>
<td>smoothing</td>
<td>The (Laplace) smoothing parameter. Defaults to 1.</td>
</tr>
<tr>
<td>thresholds</td>
<td>Thresholds in multi-class classification to adjust the probability of predicting each class. Array must have length equal to the number of classes, with values &gt; 0 excepting that at most one value may be 0. The class with largest value p/t is predicted, where p is the original probability of that class and t is the class’s threshold.</td>
</tr>
<tr>
<td>weight_col</td>
<td>(Spark 2.1.0+) Weight column name. If this is not set or empty, we treat all instance weights as 1.0.</td>
</tr>
</tbody>
</table>
features_col  Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.

label_col  Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.

prediction_col  Prediction column name.

probability_col  Column name for predicted class conditional probabilities.

raw_prediction_col  Raw prediction (a.k.a. confidence) column name.

uid  A character string used to uniquely identify the ML estimator.

...  Optional arguments; see Details.

Details

When x is a tbl_spark and formula (alternatively, response and features) is specified, the function returns a ml_model object wrapping a ml_pipeline_model which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument predicted_label_col (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted ml_pipeline_model, ml_model objects also contain a ml_pipeline object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by ml_save with type = "pipeline" to facilitate model refresh workflows.

Value

The object returned depends on the class of x.

- spark_connection: When x is a spark_connection, the function returns an instance of a ml_estimator object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- ml_pipeline: When x is a ml_pipeline, the function returns a ml_pipeline with the predictor appended to the pipeline.
- tbl_spark: When x is a tbl_spark, a predictor is constructed then immediately fit with the input tbl_spark, returning a prediction model.
- tbl_spark, with formula: specified When formula is specified, the input tbl_spark is first transformed using a RFormula transformer before being fit by the predictor. The object returned in this case is a ml_model which is a wrapper of a ml_pipeline_model.

See Also

See https://spark.apache.org/docs/latest/ml-classification-regression.html for more information on the set of supervised learning algorithms.

Other ml algorithms: ml_aft_survival_regression(), ml_decision_tree_classifier(), ml_gbt_classifier(), ml_generalized_linear_regression(), ml_isotonic_regression(), ml_linear_regression(), ml_linear_svc(), ml_logistic_regression(), ml_multilayer_perceptron_classifier(), ml_one_vs_rest(), ml_random_forest_classifier()
Examples

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

nb_model <- iris_training %>%
  ml_naive_bayes(Species ~ .)
pred <- ml_predict(nb_model, iris_test)
ml_multiclass_classification_evaluator(pred)

## End(Not run)
```

---

### Description

These methods summarize the results of Spark ML models into tidy forms.

### Usage

```r
## S3 method for class 'ml_model_naive_bayes'
tidy(x, ...)

## S3 method for class 'ml_model_naive_bayes'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_naive_bayes'
glance(x, ...)
```

### Arguments

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.
### Description

Reduction of Multiclass Classification to Binary Classification. Performs reduction using one against all strategy. For a multiclass classification with k classes, train k models (one per class). Each example is scored against all k models and the model with highest score is picked to label the example.

### Usage

```r
ml_one_vs_rest(
  x,
  formula = NULL,
  classifier = NULL,
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  uid = random_string("one_vs_rest_"),
  ...
)
```

### Arguments

- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
- **formula**: Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see `ft_r_formula` for details.
- **classifier**: Object of class ml_estimator. Base binary classifier that we reduce multiclass classification into.
- **features_col**: Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.
- **label_col**: Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.
- **prediction_col**: Prediction column name.
- **uid**: A character string used to uniquely identify the ML estimator.
- **...**: Optional arguments; see Details.

### Details

When x is a tbl_spark and formula (alternatively, response and features) is specified, the function returns a ml_model object wrapping a ml_pipeline_model which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that
ml_pca_tidiers

These methods summarize the results of Spark ML models into tidy forms.

Usage

```
## S3 method for class 'ml_model_pca'
tidy(x, ...)

## S3 method for class 'ml_model_pca'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_pca'
glance(x, ...)
```

Description

Tidying methods for Spark ML Principal Component Analysis

These methods summarize the results of Spark ML models into tidy forms.
### ml_pipeline

**Spark ML – Pipelines**

**Description**

Create Spark ML Pipelines

**Usage**

```r
ml_pipeline(x, ..., uid = random_string("pipeline_"))
```

**Arguments**

- `x` Either a `spark_connection` or `ml_pipeline_stage` objects
- `...` `ml_pipeline_stage` objects.
- `uid` A character string used to uniquely identify the ML estimator.

**Value**

When `x` is a `spark_connection`, `ml_pipeline()` returns an empty pipeline object. When `x` is a `ml_pipeline_stage`, `ml_pipeline()` returns an `ml_pipeline` with the stages set to `x` and any transformers or estimators given in `...`.

### ml_power_iteration

**Spark ML – Power Iteration Clustering**

**Description**

Power iteration clustering (PIC) is a scalable and efficient algorithm for clustering vertices of a graph given pairwise similarities as edge properties, described in the paper "Power Iteration Clustering" by Frank Lin and William W. Cohen. It computes a pseudo-eigenvector of the normalized affinity matrix of the graph via power iteration and uses it to cluster vertices. `spark.mllib` includes an implementation of PIC using GraphX as its backend. It takes an RDD of `(srcId, dstId, similarity)` tuples and outputs a model with the clustering assignments. The similarities must be nonnegative. PIC assumes that the similarity measure is symmetric. A pair `(srcId, dstId)` regardless of the ordering should appear at most once in the input data. If a pair is missing from input, their similarity is treated as zero.
Usage

\texttt{ml_power_iteration(}
  \texttt{x},
  \texttt{k = 4},
  \texttt{max_iter = 20},
  \texttt{init_mode = "random"},
  \texttt{src_col = "src"},
  \texttt{dst_col = "dst"},
  \texttt{weight_col = "weight"},
  ...)

Arguments

\texttt{x} \hspace{1cm} \text{A ‘spark_connection’ or a ‘tbl_spark’}.
\texttt{k} \hspace{1cm} \text{The number of clusters to create}.
\texttt{max_iter} \hspace{1cm} \text{The maximum number of iterations to run}.
\texttt{init_mode} \hspace{1cm} \text{This can be either “random”, which is the default, to use a random vector as vertex properties, or “degree” to use normalized sum similarities}.
\texttt{src_col} \hspace{1cm} \text{Column in the input Spark dataframe containing 0-based indexes of all source vertices in the affinity matrix described in the PIC paper}.
\texttt{dst_col} \hspace{1cm} \text{Column in the input Spark dataframe containing 0-based indexes of all destination vertices in the affinity matrix described in the PIC paper}.
\texttt{weight_col} \hspace{1cm} \text{Column in the input Spark dataframe containing non-negative edge weights in the affinity matrix described in the PIC paper}.
\texttt{...} \hspace{1cm} \text{Optional arguments. Currently unused}.

Value

A 2-column R dataframe with columns named "id" and "cluster" describing the resulting cluster assignments.

Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local")
r1 <- 1
n1 <- 80L
r2 <- 4
n2 <- 80L
gen_circle <- function(radius, num_pts) {
  # generate evenly distributed points on a circle centered at the origin
  seq(0, num_pts - 1) %>%
```
lapply(
    function(pt) {
      theta <- 2 * pi * pt / num_pts
      radius * c(cos(theta), sin(theta))
    }
  )

gaussian_similarity <- function(pt1, pt2) {
  dist2 <- sum((pt2 - pt1)^2)
  exp(-dist2 / 2)
}

gen_pic_data <- function() {
  # generate points on 2 concentric circle centered at the origin and then
  # compute pairwise Gaussian similarity values of all unordered pair of
  # points
  n <- n1 + n2
  pts <- append(gen_circle(r1, n1), gen_circle(r2, n2))
  num_unordered_pairs <- n * (n - 1) / 2
  src <- rep(0L, num_unordered_pairs)
  dst <- rep(0L, num_unordered_pairs)
  sim <- rep(0, num_unordered_pairs)

  idx <- 1
  for (i in seq(2, n)) {
    for (j in seq(i - 1)) {
      src[idx] <- i - 1L
      dst[idx] <- j - 1L
      sim[idx] <- gaussian_similarity(pts[i], pts[j])
      idx <- idx + 1
    }
  }

  tibble::tibble(src = src, dst = dst, sim = sim)
}

pic_data <- copy_to(sc, gen_pic_data())

clusters <- ml_power_iteration(
  pic_data,
  src_col = "src", dst_col = "dst", weight_col = "sim", k = 2, max_iter = 40
)
print(clusters)

## End(Not run)
ml_prefixspan

Frequent Pattern Mining – PrefixSpan

Description

PrefixSpan algorithm for mining frequent itemsets.

Usage

ml_prefixspan(
  x,
  seq_col = "sequence",
  min_support = 0.1,
  max_pattern_length = 10,
  max_local_proj_db_size = 3.2e+07,
  uid = random_string("prefixspan_"),
  ...
)

ml_freq_seq_patterns(model)

Arguments

x  A spark_connection, ml_pipeline, or a tbl_spark.
seq_col The name of the sequence column in dataset (default "sequence"). Rows with
        nulls in this column are ignored.
min_support The minimum support required to be considered a frequent sequential pattern.
max_pattern_length The maximum length of a frequent sequential pattern. Any frequent pattern
        exceeding this length will not be included in the results.
max_local_proj_db_size The maximum number of items allowed in a prefix-projected database before local
        iterative processing of the projected database begins. This parameter should
        be tuned with respect to the size of your executors.
uid A character string used to uniquely identify the ML estimator.
... Optional arguments; currently unused.
model A Prefix Span model.

Examples

## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "2.4.0")

items_df <- tibble::tibble(
  seq = list(
list(list(1, 2), list(3)),
list(list(1), list(3, 2), list(1, 2)),
list(list(1, 2), list(5)),
list(list(6))
items_sdf <- copy_to(sc, items_df, overwrite = TRUE)

prefix_span_model <- ml_prefixspan(
  sc,
  seq_col = "seq",
  min_support = 0.5,
  max_pattern_length = 5,
  max_local_proj_db_size = 32000000
)

frequent_items <- prefix_span_model$frequent_sequential_patterns(items_sdf) %>% collect()

## End(Not run)

---

**ml_random_forest_classifier**

*Spark ML – Random Forest*

**Description**

Perform classification and regression using random forests.

**Usage**

```r
ml_random_forest_classifier(
  x,
  formula = NULL,
  num_trees = 20,
  subsampling_rate = 1,
  max_depth = 5,
  min_instances_per_node = 1,
  feature_subset_strategy = "auto",
  impurity = "gini",
  min_info_gain = 0,
  max_bins = 32,
  seed = NULL,
  thresholds = NULL,
  checkpoint_interval = 10,
  cache_node_ids = FALSE,
  max_memory_in_mb = 256,
  features_col = "features",
```
ml_random_forest_classifier

label_col = "label",
prediction_col = "prediction",
probability_col = "probability",
raw_prediction_col = "rawPrediction",
uid = random_string("random_forest_classifier_"),
...

ml_random_forest(
  x,
  formula = NULL,
  type = c("auto", "regression", "classification"),
  features_col = "features",
  label_col = "label",
  prediction_col = "prediction",
  probability_col = "probability",
  raw_prediction_col = "rawPrediction",
  feature_subset_strategy = "auto",
  impurity = "auto",
  checkpoint_interval = 10,
  max_bins = 32,
  max_depth = 5,
  num_trees = 20,
  min_info_gain = 0,
  min_instances_per_node = 1,
  subsampling_rate = 1,
  seed = NULL,
  thresholds = NULL,
  cache_node_ids = FALSE,
  max_memory_in_mb = 256,
  uid = random_string("random_forest_"),
  response = NULL,
  features = NULL,
  ...
)

ml_random_forest_regressor(
  x,
  formula = NULL,
  num_trees = 20,
  subsampling_rate = 1,
  max_depth = 5,
  min_instances_per_node = 1,
  feature_subset_strategy = "auto",
  impurity = "variance",
  min_info_gain = 0,
  max_bins = 32,
  seed = NULL,
checkpoint_interval = 10,
    cache_node_ids = FALSE,
    max_memory_in_mb = 256,
    features_col = "features",
    label_col = "label",
    prediction_col = "prediction",
    uid = random_string("random_forest_regressor_"),
    ... )

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.

formula Used when x is a tbl_spark. R formula as a character string or a formula. This is used to transform the input dataframe before fitting, see ft_r_formula for details.

num_trees Number of trees to train (>= 1). If 1, then no bootstrapping is used. If > 1, then bootstrapping is done.

subsampling_rate Fraction of the training data used for learning each decision tree, in range (0, 1]. (default = 1.0)

max_depth Maximum depth of the tree (>= 0); that is, the maximum number of nodes separating any leaves from the root of the tree.

min_instances_per_node Minimum number of instances each child must have after split.

feature_subset_strategy The number of features to consider for splits at each tree node. See details for options.

impurity Criterion used for information gain calculation. Supported: "entropy" and "gini" (default) for classification and "variance" (default) for regression. For ml_decision_tree, setting "auto" will default to the appropriate criterion based on model type.

min_info_gain Minimum information gain for a split to be considered at a tree node. Should be >= 0, defaults to 0.

max_bins The maximum number of bins used for discretizing continuous features and for choosing how to split on features at each node. More bins give higher granularity.

seed Seed for random numbers.

thresholds Thresholds in multi-class classification to adjust the probability of predicting each class. Array must have length equal to the number of classes, with values > 0 excepting that at most one value may be 0. The class with largest value p/t is predicted, where p is the original probability of that class and t is the class’s threshold.

checkpoint_interval Set checkpoint interval (>= 1) or disable checkpoint (-1). E.g. 10 means that the cache will get checkpointed every 10 iterations, defaults to 10.
cache_node_ids: If FALSE, the algorithm will pass trees to executors to match instances with nodes. If TRUE, the algorithm will cache node IDs for each instance. Caching can speed up training of deeper trees. Defaults to FALSE.

max_memory_in_mb: Maximum memory in MB allocated to histogram aggregation. If too small, then 1 node will be split per iteration, and its aggregates may exceed this size. Defaults to 256.

features_col: Features column name, as a length-one character vector. The column should be single vector column of numeric values. Usually this column is output by `ft_r_formula`.

label_col: Label column name. The column should be a numeric column. Usually this column is output by `ft_r_formula`.

prediction_col: Prediction column name.

probability_col: Column name for predicted class conditional probabilities.

raw_prediction_col: Raw prediction (a.k.a. confidence) column name.

uid: A character string used to uniquely identify the ML estimator.

...: Optional arguments; see Details.

type: The type of model to fit. "regression" treats the response as a continuous variable, while "classification" treats the response as a categorical variable. When "auto" is used, the model type is inferred based on the response variable type – if it is a numeric type, then regression is used; classification otherwise.

response: (Deprecated) The name of the response column (as a length-one character vector).

features: (Deprecated) The name of features (terms) to use for the model fit.

**Details**

When `x` is a `tbl_spark` and `formula` (alternatively, `response` and `features`) is specified, the function returns a `ml_model` object wrapping a `ml_pipeline_model` which contains data pre-processing transformers, the ML predictor, and, for classification models, a post-processing transformer that converts predictions into class labels. For classification, an optional argument `predicted_label_col` (defaults to "predicted_label") can be used to specify the name of the predicted label column. In addition to the fitted `ml_pipeline_model`, `ml_model` objects also contain a `ml_pipeline` object where the ML predictor stage is an estimator ready to be fit against data. This is utilized by `ml_save` with type = "pipeline" to facilitate model refresh workflows.

The supported options for `feature_subset_strategy` are

- "auto": Choose automatically for task: If `num_trees == 1`, set to "all". If `num_trees > 1` (forest), set to "sqrt" for classification and to "onethird" for regression.
- "all": use all features
- "onethird": use 1/3 of the features
- "sqrt": use use sqrt(number of features)
- "log2": use log2(number of features)
• "n": when n is in the range (0, 1.0], use n * number of features. When n is in the range (1, number of features), use n features. (default = "auto")

**ml_random_forest** is a wrapper around **ml_random_forest_regressor.tbl_spark** and **ml_random_forest_classifier.tbl_spark** and calls the appropriate method based on model type.

**Value**

The object returned depends on the class of \( x \).

- **spark_connection**: When \( x \) is a spark_connection, the function returns an instance of a ml_estimator object. The object contains a pointer to a Spark Predictor object and can be used to compose Pipeline objects.
- **ml_pipeline**: When \( x \) is a ml_pipeline, the function returns a ml_pipeline with the predictor appended to the pipeline.
- **tbl_spark**: When \( x \) is a tbl_spark, a predictor is constructed then immediately fit with the input tbl_spark, returning a prediction model.
- **tbl_spark, with formula specified**: When formula is specified, the input tbl_spark is first transformed using a RFormula transformer before being fit by the predictor. The object returned in this case is a ml_model which is a wrapper of a ml_pipeline_model.

**See Also**

See [https://spark.apache.org/docs/latest/ml-classification-regression.html](https://spark.apache.org/docs/latest/ml-classification-regression.html) for more information on the set of supervised learning algorithms.

Other ml algorithms: **ml_aft_survival_regression()**, **ml_decision_tree_classifier()**, **ml_gbt_classifier()**, **ml_generalized_linear_regression()**, **ml_isotonic_regression()**, **ml_linear_regression()**, **ml_linear_svc()**, **ml_logistic_regression()**, **ml_multilayer_perceptron_classifier()**, **ml_naive_bayes()**, **ml_one_vs_rest()**

**Examples**

```r
## Not run:
sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

partitions <- iris_tbl %>%
  sdf_random_split(training = 0.7, test = 0.3, seed = 1111)

iris_training <- partitions$training
iris_test <- partitions$test

rf_model <- iris_training %>%
  ml_random_forest(Species ~ ., type = "classification")
pred <- ml_predict(rf_model, iris_test)
ml_multiclass_classification_evaluator(pred)
## End(Not run)
```
ml_stage

*Spark ML – Pipeline stage extraction*

**Description**

Extraction of stages from a Pipeline or PipelineModel object.

**Usage**

```
ml_stage(x, stage)
ml_stages(x, stages = NULL)
```

**Arguments**

- `x`: A `ml_pipeline` or `ml_pipeline_model` object.
- `stage`: The UID of a stage in the pipeline.
- `stages`: The UIDs of stages in the pipeline as a character vector.

**Value**

- For `ml_stage()`: The stage specified.
- For `ml_stages()`: A list of stages. If `stages` is not set, the function returns all stages of the pipeline in a list.

ml_summary

*Spark ML – Extraction of summary metrics*

**Description**

Extracts a metric from the summary object of a Spark ML model.

**Usage**

```
ml_summary(x, metric = NULL, allow_null = FALSE)
```

**Arguments**

- `x`: A Spark ML model that has a summary.
- `metric`: The name of the metric to extract. If not set, returns the summary object.
- `allow_null`: Whether null results are allowed when the metric is not found in the summary.
Description

These methods summarize the results of Spark ML models into tidy forms.

Usage

```r
## S3 method for class 'ml_model_aft_survival_regression'
tidy(x, ...)
## S3 method for class 'ml_model_aft_survival_regression'
augment(x, newdata = NULL, ...)
## S3 method for class 'ml_model_aft_survival_regression'
glance(x, ...)
```

Arguments

- **x**: a Spark ML model.
- **...**: extra arguments (not used.)
- **newdata**: a tbl_spark of new data to use for prediction.

---

Description

These methods summarize the results of Spark ML models into tidy forms.

Usage

```r
## S3 method for class 'ml_model_decision_tree_classification'
tidy(x, ...)
## S3 method for class 'ml_model_decision_tree_regression'
tidy(x, ...)
## S3 method for class 'ml_model_decision_tree_classification'
augment(x, newdata = NULL, ...)
## S3 method for class `\_.ml_model_decision_tree_classification`'
augment(x, new_data = NULL, ...)
```
### S3 method for class 'ml_model_decision_tree_regression'
augment(x, newdata = NULL, ...)

### S3 method for class 'ml_model_random_forest_regression'
augment(x, newdata = NULL, ...)

glance(x, ...)

tidy(x, ...)

## S3 method for class 'ml_model_random_forest_classification'
augment(x, newdata = NULL, ...)

glance(x, ...)

tidy(x, ...)

## S3 method for class 'ml_model_gbt_classification'
tidy(x, ...)

## S3 method for class 'ml_model_gbt_regression'
tidy(x, ...)

## S3 method for class 'ml_model_gbt_classification'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_gbt_regression'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_random_forest_regression'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_random_forest_classification'
augment(x, newdata = NULL, ...)

glance(x, ...)

tidy(x, ...)

tidy(x, ...)

## S3 method for class 'ml_model_random_forest_classification'

glance(x, ...)

## S3 method for class 'ml_model_random_forest_regression'

glance(x, ...)

tidy(x, ...)

## S3 method for class 'ml_model_random_forest_regression'

## S3 method for class 'ml_model_gbt_regression'
augment(x, newdata = NULL, ...)

## S3 method for class `ml_model_gbt_regression`
augment(x, new_data = NULL, ...)

## S3 method for class 'ml_model_gbt_classification'
glance(x, ...)

## S3 method for class 'ml_model_gbt_regression'
glance(x, ...)

### Arguments

- **x**: a Spark ML model.
- **...**: extra arguments (not used.)
- **newdata**: a tbl_spark of new data to use for prediction.
- **new_data**: a tbl_spark of new data to use for prediction.

---

### ml_uid

**Spark ML – UID**

### Description

Extracts the UID of an ML object.

### Usage

```
ml_uid(x)
```

### Arguments

- **x**: A Spark ML object

---

### ml_unsupervised_tidiers

**Tidying methods for Spark ML unsupervised models**

### Description

These methods summarize the results of Spark ML models into tidy forms.
Usage

```r
## S3 method for class 'ml_model_kmeans'
tidy(x, ...)

## S3 method for class 'ml_model_kmeans'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_kmeans'
glance(x, ...)

## S3 method for class 'ml_model_bisecting_kmeans'
tidy(x, ...)

## S3 method for class 'ml_model_bisecting_kmeans'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_bisecting_kmeans'
glance(x, ...)

## S3 method for class 'ml_model_gaussian_mixture'
tidy(x, ...)

## S3 method for class 'ml_model_gaussian_mixture'
augment(x, newdata = NULL, ...)

## S3 method for class 'ml_model_gaussian_mixture'
glance(x, ...)
```

Arguments

- `x` a Spark ML model.
- `...` extra arguments (not used.)
- `newdata` a tbl_spark of new data to use for prediction.

Description

See `mutate` for more details.
na.replace  Replace Missing Values in Objects

Description
This S3 generic provides an interface for replacing NA values within an object.

Usage
na.replace(object, ...)

Arguments
object An R object.
... Arguments passed along to implementing methods.

nest  Nest

Description
See nest for more details.

pivot_longer  Pivot longer

Description
See pivot_longer for more details.

pivot_wider  Pivot wider

Description
See pivot_wider for more details.
random_string    Random string generation

Description
Generate a random string with a given prefix.

Usage
random_string(prefix = "table")

Arguments
prefix    A length-one character vector.

reactiveSpark    Reactive spark reader

Description
Given a spark object, returns a reactive data source for the contents of the spark object. This function is most useful to read Spark streams.

Usage
reactiveSpark(x, intervalMillis = 1000, session = NULL)

Arguments
x    An object coercable to a Spark DataFrame.
intervalMillis    Approximate number of milliseconds to wait to retrieve updated data frame. This can be a numeric value, or a function that returns a numeric value.
session    The user session to associate this file reader with, or NULL if none. If non-null, the reader will automatically stop when the session ends.
**registerDoSpark**

*Register a Parallel Backend*

**Description**

Registers a parallel backend using the foreach package.

**Usage**

```r
registerDoSpark(spark_conn, parallelism = NULL, ...)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>spark_conn</code></td>
<td>Spark connection to use</td>
</tr>
<tr>
<td><code>parallelism</code></td>
<td>Level of parallelism to use for task execution (if unspecified, then it will take the value of <code>SparkContext.defaultParallelism()</code> which by default is the number of cores available to the <code>sparklyr</code> application)</td>
</tr>
<tr>
<td><code>...</code></td>
<td>additional options for sparklyr parallel backend (currently only the only valid option is <code>nocompile = T, F</code>)</td>
</tr>
</tbody>
</table>

**Value**

None

**Examples**

```r
## Not run:
sc <- spark_connect(master = "local")
registerDoSpark(sc, nocompile = FALSE)
## End(Not run)
```

---

**register_extension**

*Register a Package that Implements a Spark Extension*

**Description**

Registering an extension package will result in the package being automatically scanned for spark dependencies when a connection to Spark is created.

**Usage**

```r
register_extension(package)
registered_extensions()
```
Arguments

package The package(s) to register.

Note

Packages should typically register their extensions in their .onLoad hook – this ensures that their extensions are registered when their namespaces are loaded.

replace_na Replace NA

Description

See replace_na for more details.

right_join Right join

Description

See right_join for more details.

sdf-saveload Save / Load a Spark DataFrame

Description

Routines for saving and loading Spark DataFrames.

Usage

sdf_save_table(x, name, overwrite = FALSE, append = FALSE)

sdf_load_table(sc, name)

sdf_save_parquet(x, path, overwrite = FALSE, append = FALSE)

sdf_load_parquet(sc, path)
Arguments

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **name**: The table name to assign to the saved Spark DataFrame.
- **overwrite**: Boolean; overwrite a pre-existing table of the same name?
- **append**: Boolean; append to a pre-existing table of the same name?
- **sc**: A `spark_connection` object.
- **path**: The path where the Spark DataFrame should be saved.

---

**sdf-transform-methods**  
*Spark ML – Transform, fit, and predict methods (sdf Interface)*

**Description**

Deprecated methods for transformation, fit, and prediction. These are mirrors of the corresponding `ml-transform-methods`.

**Usage**

- `sdf_predict(x, model, ...)`
- `sdf_transform(x, transformer, ...)`
- `sdf_fit(x, estimator, ...)`
- `sdf_fit_and_transform(x, estimator, ...)`

**Arguments**

- **x**: A `tbl_spark`.
- **model**: A `ml_transformer` or a `ml_model` object.
- **...**: Optional arguments passed to the corresponding `ml_` methods.
- **transformer**: A `ml_transformer` object.
- **estimator**: A `ml_estimator` object.

**Value**

`sdf_predict()`, `sdf_transform()`, and `sdf_fit_and_transform()` return a transformed dataframe whereas `sdf_fit()` returns a `ml_transformer`. 
sdf_along

Create DataFrame for along Object

Description

Creates a DataFrame along the given object.

Usage

sdf_along(sc, along, repartition = NULL, type = c("integer", "integer64"))

Arguments

- **sc**: The associated Spark connection.
- **along**: Takes the length from the length of this argument.
- **repartition**: The number of partitions to use when distributing the data across the Spark cluster.
- **type**: The data type to use for the index, either "integer" or "integer64".

sdf_bind

Bind multiple Spark DataFrames by row and column

Description

sdf_bind_rows() and sdf_bind_cols() are implementation of the common pattern of do.call(rbind, sdfs) or do.call(cbind, sdfs) for binding many Spark DataFrames into one.

Usage

sdf_bind_rows(..., id = NULL)

sdf_bind_cols(...)

Arguments

- **...**: Spark tbls to combine. Each argument can either be a Spark DataFrame or a list of Spark DataFrames
- **id**: Data frame identifier.

When row-binding, columns are matched by name, and any missing columns with be filled with NA.

When column-binding, rows are matched by position, so all data frames must have the same number of rows.

When **id** is supplied, a new column of identifiers is created to link each row to its original Spark DataFrame. The labels are taken from the named arguments to sdf_bind_rows(). When a list of Spark DataFrames is supplied, the labels are taken from the names of the list. If no names are found a numeric sequence is used instead.
Details

The output of `sdf_bind_rows()` will contain a column if that column appears in any of the inputs.

Value

`sdf_bind_rows()` and `sdf_bind_cols()` return `tbl_spark`

<table>
<thead>
<tr>
<th>sdf_broadcast</th>
<th>Broadcast hint</th>
</tr>
</thead>
</table>

Description

Used to force broadcast hash joins.

Usage

`sdf_broadcast(x)`

Arguments

- `x` A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.

<table>
<thead>
<tr>
<th>sdf_checkpoint</th>
<th>Checkpoint a Spark DataFrame</th>
</tr>
</thead>
</table>

Description

Checkpoint a Spark DataFrame

Usage

`sdf_checkpoint(x, eager = TRUE)`

Arguments

- `x` an object coercible to a Spark DataFrame
- `eager` whether to truncate the lineage of the DataFrame
**sdf_coalesce**

*Coalesces a Spark DataFrame*

**Description**

Coalesces a Spark DataFrame

**Usage**

```r
sdf_coalesce(x, partitions)
```

**Arguments**

- `x` A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- `partitions` number of partitions

**sdf_collect**

*Collect a Spark DataFrame into R.*

**Description**

Collects a Spark dataframe into R.

**Usage**

```r
sdf_collect(object, impl = c("row-wise", "row-wise-iter", "column-wise"), ...)
```

**Arguments**

- `object` Spark dataframe to collect
- `impl` Which implementation to use while collecting Spark dataframe - row-wise: fetch the entire dataframe into memory and then process it row-by-row - row-wise-iter: iterate through the dataframe using RDD local iterator, processing one row at a time (hence reducing memory footprint) - column-wise: fetch the entire dataframe into memory and then process it column-by-column NOTE: (1) this will not apply to streaming or arrow use cases (2) this parameter will only affect implementation detail, and will not affect result of `sdf_collect`, and should only be set if performance profiling indicates any particular choice will be significantly better than the default choice ("row-wise")
- `...` Additional options.
Copy an Object into Spark

Description

Copy an object into Spark, and return an R object wrapping the copied object (typically, a Spark DataFrame).

Usage

sdf_copy_to(sc, x, name, memory, repartition, overwrite, struct_columns, ...)

sdf_import(x, sc, name, memory, repartition, overwrite, struct_columns, ...)

Arguments

- **sc**: The associated Spark connection.
- **x**: An R object from which a Spark DataFrame can be generated.
- **name**: The name to assign to the copied table in Spark.
- **memory**: Boolean; should the table be cached into memory?
- **repartition**: The number of partitions to use when distributing the table across the Spark cluster. The default (0) can be used to avoid partitioning.
- **overwrite**: Boolean; overwrite a pre-existing table with the name *name* if one already exists?
- **struct_columns**: (only supported with Spark 2.4.0 or higher) A list of columns from the source data frame that should be converted to Spark SQL StructType columns. The source columns can contain either json strings or nested lists. All rows within each source column should have identical schemas (because otherwise the conversion result will contain unexpected null values or missing values as Spark currently does not support schema discovery on individual rows within a struct column).
- **...**: Optional arguments, passed to implementing methods.

Advanced Usage

*sdf_copy_to* is an S3 generic that, by default, dispatches to *sdf_import*. Package authors that would like to implement *sdf_copy_to* for a custom object type can accomplish this by implementing the associated method on *sdf_import*.

See Also

Other Spark data frames: *sdf_distinct()*,*sdf_random_split()*,*sdf_register()*,*sdf_sample()*,*sdf_sort()*,*sdf_weighted_sample()*
Examples

```r
## Not run:
sc <- spark_connect(master = "spark://HOST:PORT")
sdf_copy_to(sc, iris)
## End(Not run)
```

### sdf_crosstab

**Cross Tabulation**

**Description**

Builds a contingency table at each combination of factor levels.

**Usage**

```r
sdf_crosstab(x, col1, col2)
```

**Arguments**

- `x`: A Spark DataFrame
- `col1`: The name of the first column. Distinct items will make the first item of each row.
- `col2`: The name of the second column. Distinct items will make the column names of the DataFrame.

**Value**

A DataFrame containing the contingency table.

### sdf_debug_string

**Debug Info for Spark DataFrame**

**Description**

Prints plan of execution to generate `x`. This plan will, among other things, show the number of partitions in parenthesis at the far left and indicate stages using indentation.

**Usage**

```r
sdf_debug_string(x, print = TRUE)
```

**Arguments**

- `x`: An R object wrapping, or containing, a Spark DataFrame.
- `print`: Print debug information?
**sdf_describe**  
*Compute summary statistics for columns of a data frame*

**Description**
Compute summary statistics for columns of a data frame

**Usage**
```r
sdf_describe(x, cols = colnames(x))
```

**Arguments**
- **x**  
  An object coercible to a Spark DataFrame
- **cols**  
  Columns to compute statistics for, given as a character vector

**sdf_dim**  
*Support for Dimension Operations*

**Description**
`sdf_dim()`, `sdf_nrow()` and `sdf_ncol()` provide similar functionality to `dim()`, `nrow()` and `ncol()`.

**Usage**
```r
sdf_dim(x)
sdf_nrow(x)
sdf_nrow(x)
sdf_ncol(x)
```

**Arguments**
- **x**  
  An object (usually a `spark_tbl`).
sdf_distinct  

Invoke distinct on a Spark DataFrame

Description

Invoke distinct on a Spark DataFrame

Usage

sdf_distinct(x, ..., name)

Arguments

x  
A Spark DataFrame.

...  
Optional variables to use when determining uniqueness. If there are multiple rows for a given combination of inputs, only the first row will be preserved. If omitted, will use all variables.

name  
A name to assign this table. Passed to [sdf_register()].

Transforming Spark DataFrames

The family of functions prefixed with sdf_ generally access the Scala Spark DataFrame API directly, as opposed to the dplyr interface which uses Spark SQL. These functions will 'force' any pending SQL in a dplyr pipeline, such that the resulting tbl_spark object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the R level, these operations will only be executed when you explicitly collect() the table.

See Also

Other Spark data frames: sdf_copy_to(), sdf_random_split(), sdf_register(), sdf_sample(), sdf_sort(), sdf_weighted_sample()

sdf_drop_duplicates  

Remove duplicates from a Spark DataFrame

Description

Remove duplicates from a Spark Dataframe

Usage

sdf_drop_duplicates(x, cols = NULL)
sdf_expand_grid

Arguments

- `x`: An object coercible to a Spark DataFrame
- `cols`: Subset of Columns to consider, given as a character vector

sdf_expand_grid
Create a Spark dataframe containing all combinations of inputs

Description

Given one or more R vectors/factors or single-column Spark dataframes, perform an expand.grid operation on all of them and store the result in a Spark dataframe

Usage

sdf_expand_grid(
  sc,
  ...,
  broadcast_vars = NULL,
  memory = TRUE,
  repartition = NULL,
  partition_by = NULL
)

Arguments

- `sc`: The associated Spark connection.
- `...`: Each input variable can be either a R vector/factor or a Spark dataframe. Unnamed inputs will assume the default names of `Var1`, `Var2`, etc in the result, similar to what `expand.grid` does for unnamed inputs.
- `broadcast_vars`: Indicates which input(s) should be broadcasted to all nodes of the Spark cluster during the join process (default: none).
- `memory`: Boolean; whether the resulting Spark dataframe should be cached into memory (default: TRUE)
- `repartition`: Number of partitions the resulting Spark dataframe should have
- `partition_by`: Vector of column names used for partitioning the resulting Spark dataframe, only supported for Spark 2.0+

Examples

```r
# Not run:
sc <- spark_connect(master = "local")
grid_sdf <- sdf_expand_grid(sc, seq(5), rnorm(10), letters)

# End(Not run)
```
sdf_from_avro  
Convert column(s) from avro format

Description
Convert column(s) from avro format

Usage
sdf_from_avro(x, cols)

Arguments
- **x**: An object coercible to a Spark DataFrame
- **cols**: Named list of columns to transform from Avro format plus a valid Avro schema string for each column, where column names are keys and column schema strings are values (e.g., `c(example_primitive_col = "string", example_complex_col = "{"type":"record","name":"person","fields":[{"name": "person_name","type": "string"},
{"name": "person_id","type": "long"}]"}`)

sdf_is_streaming  Spark DataFrame is Streaming

Description
Is the given Spark DataFrame a streaming data?

Usage
sdf_is_streaming(x)

Arguments
- **x**: A spark_connection, ml_pipeline, or a tbl_spark.
**sdf_last_index**

*Returns the last index of a Spark DataFrame*

**Description**

Returns the last index of a Spark DataFrame. The Spark `mapPartitionsWithIndex` function is used to iterate through the last nonempty partition of the RDD to find the last record.

**Usage**

```r
sdf_last_index(x, id = "id")
```

**Arguments**

- **x**
  - A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.
- **id**
  - The name of the index column.

---

**sdf_len**

*Create DataFrame for Length*

**Description**

Creates a DataFrame for the given length.

**Usage**

```r
sdf_len(sc, length, repartition = NULL, type = c("integer", "integer64"))
```

**Arguments**

- **sc**
  - The associated Spark connection.
- **length**
  - The desired length of the sequence.
- **repartition**
  - The number of partitions to use when distributing the data across the Spark cluster.
- **type**
  - The data type to use for the index, either "integer" or "integer64".
sdf_num_partitions

*Description*

Gets number of partitions of a Spark DataFrame

*Usage*

`sdf_num_partitions(x)`

*Arguments*

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.

---

sdf_partition_sizes

*Description*

Compute the number of records within each partition of a Spark DataFrame

*Usage*

`sdf_partition_sizes(x)`

*Arguments*

- **x**: A `spark_connection`, `ml_pipeline`, or a `tbl_spark`.

*Examples*

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "spark://HOST:PORT")
example_sdf <- sdf_len(sc, 100L, repartition = 10L)
example_sdf %>%
  sdf_partition_sizes() %>%
  print()

## End(Not run)
```
sdf_persist

Persist a Spark DataFrame

Description

Persist a Spark DataFrame, forcing any pending computations and (optionally) serializing the results to disk.

Usage

sdf_persist(x, storage.level = "MEMORY_AND_DISK", name = NULL)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
storage.level The storage level to be used. Please view the Spark Documentation for information on what storage levels are accepted.
name A name to assign this table. Passed to [sdf_register()].

Details

Spark DataFrames invoke their operations lazily – pending operations are deferred until their results are actually needed. Persisting a Spark DataFrame effectively ‘forces’ any pending computations, and then persists the generated Spark DataFrame as requested (to memory, to disk, or otherwise).

Users of Spark should be careful to persist the results of any computations which are non-deterministic – otherwise, one might see that the values within a column seem to ‘change’ as new operations are performed on that data set.

sdf_pivot

Pivot a Spark DataFrame

Description

Construct a pivot table over a Spark Dataframe, using a syntax similar to that from reshape2::dcast.

Usage

sdf_pivot(x, formula, fun.aggregate = "count")
Arguments

x
A spark_connection, ml_pipeline, or a tbl_spark.

formula
A two-sided R formula of the form $x_1 + x_2 + \ldots \sim y_1$. The left-hand side of the formula indicates which variables are used for grouping, and the right-hand side indicates which variable is used for pivoting. Currently, only a single pivot column is supported.

fun.aggregate
How should the grouped dataset be aggregated? Can be a length-one character vector, giving the name of a Spark aggregation function to be called; a named R list mapping column names to an aggregation method, or an R function that is invoked on the grouped dataset.

Examples

```r
# Not run:
library(sparklyr)
library(dplyr)

sc <- spark_connect(master = "local")
iris_tbl <- sdf_copy_to(sc, iris, name = "iris_tbl", overwrite = TRUE)

# aggregating by mean
iris_tbl %>%
  mutate(Petal_Width = ifelse(Petal_Width > 1.5, "High", "Low")) %>%
  sdf_pivot(Petal_Width ~ Species,
            fun.aggregate = list(Petal_Length = "mean"))

# aggregating all observations in a list
iris_tbl %>%
  mutate(Petal_Width = ifelse(Petal_Width > 1.5, "High", "Low")) %>%
  sdf_pivot(Petal_Width ~ Species,
            fun.aggregate = list(Petal_Length = "collect_list"))

# End(Not run)
```
Usage

```r
sdf_project(
  object,
  newdata,
  features = dimnames(object$pc)[[1]],
  feature_prefix = NULL,
  ...
)
```

Arguments

- **object**: A Spark PCA model object
- **newdata**: An object coercible to a Spark DataFrame
- **features**: A vector of names of columns to be projected
- **feature_prefix**: The prefix used in naming the output features
- **...**: Optional arguments; currently unused.

Transforming Spark DataFrames

The family of functions prefixed with `sdf_` generally access the Scala Spark DataFrame API directly, as opposed to the `dplyr` interface which uses Spark SQL. These functions will 'force' any pending SQL in a `dplyr` pipeline, such that the resulting `tbl_spark` object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the R level, these operations will only be executed when you explicitly `collect()` the table.

`sdf_quantile` | *Compute (Approximate) Quantiles with a Spark DataFrame*

Description

Given a numeric column within a Spark DataFrame, compute approximate quantiles.

Usage

```r
sdf_quantile(
  x,
  column,
  probabilities = c(0, 0.25, 0.5, 0.75, 1),
  relative.error = 1e-05,
  weight.column = NULL
)
```
**sdf_random_split**

**Arguments**

- **x**: A spark_connection, ml_pipeline, or tbl_spark.
- **column**: The column(s) for which quantiles should be computed. Multiple columns are only supported in Spark 2.0+.
- **probabilities**: A numeric vector of probabilities, for which quantiles should be computed.
- **relative.error**: The maximal possible difference between the actual percentile of a result and its expected percentile (e.g., if ‘relative.error’ is 0.01 and ‘probabilities’ is 0.95, then any value between the 94th and 96th percentile will be considered an acceptable approximation).
- **weight.column**: If not NULL, then a generalized version of the Greenwald-Khanna algorithm will be run to compute weighted percentiles, with each sample from ‘column’ having a relative weight specified by the corresponding value in ‘weight.column’. The weights can be considered as relative frequencies of sample data points.

**Description**

Partition a Spark DataFrame into multiple groups. This routine is useful for splitting a DataFrame into, for example, training and test datasets.

**Usage**

```r
sdf_random_split(
  x,
  ...,
  weights = NULL,
  seed = sample(.Machine$integer.max, 1)
)
```

```r
sdf_partition(x, ..., weights = NULL, seed = sample(.Machine$integer.max, 1))
```

**Arguments**

- **x**: An object coercable to a Spark DataFrame.
- **...**: Named parameters, mapping table names to weights. The weights will be normalized such that they sum to 1.
- **weights**: An alternate mechanism for supplying weights – when specified, this takes precedence over the ... arguments.
- **seed**: Random seed to use for randomly partitioning the dataset. Set this if you want your partitioning to be reproducible on repeated runs.
Details

The sampling weights define the probability that a particular observation will be assigned to a particular partition, not the resulting size of the partition. This implies that partitioning a DataFrame with, for example,

\[
\text{sdf\_random\_split}(x, \text{training} = 0.5, \text{test} = 0.5)
\]

is not guaranteed to produce training and test partitions of equal size.

Value

An \( \mathbb{R} \) list of tbl_sparks.

Transforming Spark DataFrames

The family of functions prefixed with sdf_ generally access the Scala Spark DataFrame API directly, as opposed to the dplyr interface which uses Spark SQL. These functions will 'force' any pending SQL in a dplyr pipeline, such that the resulting tbl_spark object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the \( \mathbb{R} \) level, these operations will only be executed when you explicitly \text{collect()} the table.

See Also

Other Spark data frames: sdf_copy_to(), sdf_distinct(), sdf_register(), sdf_sample(), sdf_sort(), sdf_weighted_sample()

Examples

```r
## Not run:
# randomly partition data into a 'training' and 'test'
# dataset, with 60% of the observations assigned to the
# 'training' dataset, and 40% assigned to the 'test' dataset
data(diamonds, package = "ggplot2")
diamonds_tbl <- copy_to(sc, diamonds, "diamonds")
partitions <- diamonds_tbl %>%
  sdf_random_split(training = 0.6, test = 0.4)
print(partitions)

# alternate way of specifying weights
weights <- c(training = 0.6, test = 0.4)
diamonds_tbl %>% sdf_random_split(weights = weights)
```

## End(Not run)
**sdf_rbeta**

*Generate random samples from a Beta distribution*

**Description**

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a Beta distribution.

**Usage**

```r
sdf_rbeta(  
  sc,  
  n,  
  shape1,  
  shape2,  
  num_partitions = NULL,  
  seed = NULL,  
  output_col = "x"  
)
```

**Arguments**

- `sc` A Spark connection.
- `n` Sample Size (default: 1000).
- `shape1` Non-negative parameter (alpha) of the Beta distribution.
- `shape2` Non-negative parameter (beta) of the Beta distribution.
- `num_partitions` Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
- `seed` Random seed (default: a random long integer).
- `output_col` Name of the output column containing sample values (default: "x").

**See Also**

Other Spark statistical routines: `sdf_rbinom()`, `sdf_rcauchy()`, `sdf_rchisq()`, `sdf_rexp()`, `sdf_rgamma()`, `sdf_rgeom()`, `sdf_rhyper()`, `sdf_rlnorm()`, `sdf_rnorm()`, `sdf_rpois()`, `sdf_rt()`, `sdf_runif()`, `sdf_rweibull()`
sdf_rbinom

Generate random samples from a binomial distribution

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a binomial distribution.

Usage

```r
sdf_rbinom(
    sc,
    n,
    size,
    prob,
    num_partitions = NULL,
    seed = NULL,
    output_col = "x"
)
```

Arguments

- `sc` A Spark connection.
- `n` Sample Size (default: 1000).
- `size` Number of trials (zero or more).
- `prob` Probability of success on each trial.
- `num_partitions` Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
- `seed` Random seed (default: a random long integer).
- `output_col` Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: `sdf_rbeta()`, `sdf_rcauchy()`, `sdf_rchisq()`, `sdf_rexp()`, `sdf_rgamma()`, `sdf_rgeom()`, `sdf_rhyper()`, `sdf_rlnorm()`, `sdf_rnorm()`, `sdf_rpois()`, `sdf_rt()`, `sdf_runif()`, `sdf_rweibull()`
### sdf_rcauchy

#### Generate random samples from a Cauchy distribution

**Description**

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a Cauchy distribution.

**Usage**

```r
sdf_rcauchy(
  sc,
  n,
  location = 0,
  scale = 1,
  num_partitions = NULL,
  seed = NULL,
  output_col = "x"
)
```

**Arguments**

- **sc**: A Spark connection.
- **n**: Sample Size (default: 1000).
- **location**: Location parameter of the distribution.
- **scale**: Scale parameter of the distribution.
- **num_partitions**: Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
- **seed**: Random seed (default: a random long integer).
- **output_col**: Name of the output column containing sample values (default: "x").

**See Also**

Other Spark statistical routines: `sdf_rbeta()`, `sdf_rbinom()`, `sdf_rchisq()`, `sdf_rexp()`, `sdf_rgamma()`, `sdf_rgeom()`, `sdf_rhyper()`, `sdf_rlnorm()`, `sdf_rnorm()`, `sdf_rpois()`, `sdf_rt()`, `sdf_runif()`, `sdf_rweibull()`
sdf_rchisq  Generate random samples from a chi-squared distribution

Description
Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a chi-squared distribution.

Usage
sdf_rchisq(sc, n, df, num_partitions = NULL, seed = NULL, output_col = "x")

Arguments
sc
A Spark connection.
n
Sample Size (default: 1000).
df
Degrees of freedom (non-negative, but can be non-integer).
num_partitions
Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
seed
Random seed (default: a random long integer).
output_col
Name of the output column containing sample values (default: "x").

See Also
Other Spark statistical routines: sdf_rbeta(), sdf_rbinom(), sdf_rcauchy(), sdf_rexp(), sdf_rgamma(), sdf_rgeom(), sdf_rhyper(), sdf_rlnorm(), sdf_rnorm(), sdf_rpois(), sdf_rt(), sdf_runif(), sdf_rweibull()

sdf_read_column  Read a Column from a Spark DataFrame

Description
Read a single column from a Spark DataFrame, and return the contents of that column back to R.

Usage
sdf_read_column(x, column)

Arguments
x
A spark_connection, ml_pipeline, or a tbl_spark.
column
The name of a column within x.

Details
It is expected for this operation to preserve row order.
sdf_register  
*Register a Spark DataFrame*

**Description**

Registers a Spark DataFrame (giving it a table name for the Spark SQL context), and returns a tbl_spark.

**Usage**

```r
sdf_register(x, name = NULL)
```

**Arguments**

- `x`: A Spark DataFrame.
- `name`: A name to assign this table.

**Transforming Spark DataFrames**

The family of functions prefixed with `sdf_` generally access the Scala Spark DataFrame API directly, as opposed to the `dplyr` interface which uses Spark SQL. These functions will 'force' any pending SQL in a `dplyr` pipeline, such that the resulting tbl_spark object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the R level, these operations will only be executed when you explicitly `collect()` the table.

**See Also**

Other Spark data frames: `sdf_copy_to()`, `sdf_distinct()`, `sdf_random_split()`, `sdf_sample()`, `sdf_sort()`, `sdf_weighted_sample()`

---

sdf_repartition  
*Repartition a Spark DataFrame*

**Description**

Repartition a Spark DataFrame

**Usage**

```r
sdf_repartition(x, partitions = NULL, partition_by = NULL)
```

**Arguments**

- `x`: A spark_connection, ml_pipeline, or a tbl_spark.
- `partitions`: number of partitions
- `partition_by`: vector of column names used for partitioning, only supported for Spark 2.0+
**Description**

This generic method returns a Spark DataFrame with model residuals added as a column to the model training data.

**Usage**

```r
## S3 method for class 'ml_model_generalized_linear_regression'
sdf_residuals(
  object,
  type = c("deviance", "pearson", "working", "response"),
  ...
)
```

```r
## S3 method for class 'ml_model_linear_regression'
sdf_residuals(object, ...)
```

**Arguments**

- `object`: Spark ML model object.
- `type`: type of residuals which should be returned.
- `...`: additional arguments

**sdf_rexp**

*Generate random samples from an exponential distribution*

**Description**

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from an exponential distribution.

**Usage**

```r
sdf_rexp(sc, n, rate = 1, num_partitions = NULL, seed = NULL, output_col = "x")
```
Arguments

sc: A Spark connection.
n: Sample Size (default: 1000).
rate: Rate of the exponential distribution (default: 1). The exponential distribution with rate lambda has mean 1 / lambda and density f(x) = lambda e^- lambda x.
num_partitions: Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
seed: Random seed (default: a random long integer).
output_col: Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: sdf_rbeta(), sdf_rbinom(), sdf_rcauchy(), sdf_rchisq(), sdf_rgamma(), sdf_rgeom(), sdf_rhyper(), sdf_rlnorm(), sdf_rnorm(), sdf_rpois(), sdf_rt(), sdf_runif(), sdf_rweibull()

sdf_rgamma

Generate random samples from a Gamma distribution

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a Gamma distribution.

Usage

sdf_rgamma(
    sc, n, shape, rate = 1, num_partitions = NULL, seed = NULL, output_col = "x"
)

Arguments

sc: A Spark connection.
n: Sample Size (default: 1000).
shape: Shape parameter (greater than 0) for the Gamma distribution.
rate: Rate parameter (greater than 0) for the Gamma distribution (scale is 1/rate).
num_partitions: Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
seed: Random seed (default: a random long integer).
output_col: Name of the output column containing sample values (default: "x").
### sdf_rgeom

Generate random samples from a geometric distribution

---

**Description**

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a geometric distribution.

**Usage**

```r
sdf_rgeom(sc, n, prob, num_partitions = NULL, seed = NULL, output_col = "x")
```

**Arguments**

- `sc`: A Spark connection.
- `n`: Sample Size (default: 1000).
- `prob`: Probability of success in each trial.
- `num_partitions`: Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
- `seed`: Random seed (default: a random long integer).
- `output_col`: Name of the output column containing sample values (default: "x").

**See Also**

Other Spark statistical routines: `sdf_rbeta()`, `sdf_rbinom()`, `sdf_rcauchy()`, `sdf_rchisq()`, `sdf_rexp()`, `sdf_rgeom()`, `sdf_rhyper()`, `sdf_rlnorm()`, `sdf_rnorm()`, `sdf_rpois()`, `sdf_rt()`, `sdf_runif()`, `sdf_rweibull()`
`sdf_rhyper`  
*Generate random samples from a hypergeometric distribution*

**Description**

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a hypergeometric distribution.

**Usage**

```r
sdf_rhyper(
  sc, 
  nn, 
  m, 
  n, 
  k, 
  num_partitions = NULL, 
  seed = NULL, 
  output_col = "x"
)
```

**Arguments**

- `sc`  
  A Spark connection.

- `nn`  
  Sample Size.

- `m`  
  The number of successes among the population.

- `n`  
  The number of failures among the population.

- `k`  
  The number of draws.

- `num_partitions`  
  Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).

- `seed`  
  Random seed (default: a random long integer).

- `output_col`  
  Name of the output column containing sample values (default: "x").

**See Also**

Other Spark statistical routines: `sdf_rbeta()`, `sdf_rbinom()`, `sdf_rcauchy()`, `sdf_rchisq()`, `sdf_rexp()`, `sdf_rgamma()`, `sdf_rgeom()`, `sdf_rlnorm()`, `sdf_rnorm()`, `sdf_rpois()`, `sdf_rt()`, `sdf_runif()`, `sdf_rweibull()`
sdf_rlnorm

Generate random samples from a log normal distribution

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a log normal distribution.

Usage

sdf_rlnorm(
  sc,
  n,
  meanlog = 0,
  sdlog = 1,
  num_partitions = NULL,
  seed = NULL,
  output_col = "x"
)

Arguments

sc A Spark connection.
n Sample Size (default: 1000).
meanlog The mean of the normally distributed natural logarithm of this distribution.
sdlog The Standard deviation of the normally distributed natural logarithm of this distribution.
num_partitions Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
seed Random seed (default: a random long integer).
output_col Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: sdf_rbeta(), sdf_rbinom(), sdf_rcauchy(), sdf_rchisq(), sdf_rexp(), sdf_rgamma(), sdf_rgeom(), sdf_rhyper(), sdf_rnorm(), sdf_rpois(), sdf_rt(), sdf_runif(), sdf_rweibull()
sdf_rnorm  

Generate random samples from the standard normal distribution

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from the standard normal distribution.

Usage

sdf_rnorm(
  sc,
  n,
  mean = 0,
  sd = 1,
  num_partitions = NULL,
  seed = NULL,
  output_col = "x"
)

Arguments

sc  A Spark connection.

n  Sample Size (default: 1000).

mean  The mean value of the normal distribution.

sd  The standard deviation of the normal distribution.

num_partitions  Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).

seed  Random seed (default: a random long integer).

output_col  Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: sdf_rbeta(), sdf_rbinom(), sdf_rcauchy(), sdf_rchisq(), sdf_rexp(), sdf_rgamma(), sdf_rgeom(), sdf_rhyper(), sdf_rlnorm(), sdf_rpois(), sdf_rt(), sdf_runif(), sdf_rweibull()
sdf_rpois

Generate random samples from a Poisson distribution

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a Poisson distribution.

Usage

sdf_rpois(sc, n, lambda, num_partitions = NULL, seed = NULL, output_col = "x")

Arguments

- **sc**: A Spark connection.
- **n**: Sample Size (default: 1000).
- **lambda**: Mean, or lambda, of the Poisson distribution.
- **num_partitions**: Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
- **seed**: Random seed (default: a random long integer).
- **output_col**: Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: sdf_rbeta(), sdf_rbinom(), sdf_rcauchy(), sdf_rchisq(), sdf_rexp(), sdf_rgamma(), sdf_rgeom(), sdf_rhyper(), sdf_rlnorm(), sdf_rnorm(), sdf_rnorm(), sdf_rweibull(), sdf_runif(), sdf_rweibull()

---

sdf_rt

Generate random samples from a t-distribution

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a t-distribution.

Usage

sdf_rt(sc, n, df, num_partitions = NULL, seed = NULL, output_col = "x")
sdf_runif

Generate random samples from the uniform distribution U(0, 1).

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from the uniform distribution U(0, 1).

Usage

sdf_runif(
  sc,
  n,
  min = 0,
  max = 1,
  num_partitions = NULL,
  seed = NULL,
  output_col = "x"
)

Arguments

sc A Spark connection.

n Sample Size (default: 1000).

min The lower limit of the distribution.

max The upper limit of the distribution.

num_partitions Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).

seed Random seed (default: a random long integer).

output_col Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: sdf_rbeta(), sdf_rbinom(), sdf_rcauchy(), sdf_rchisq(), sdf_rexp(), sdf_rgamma(), sdf_rgeom(), sdf_rhyper(), sdf_rlnorm(), sdf_rnorm(), sdf_rpois(), sdf_runif(), sdf_rweibull()
sdf_rweibull

Generate random samples from a Weibull distribution.

Description

Generator method for creating a single-column Spark dataframes comprised of i.i.d. samples from a Weibull distribution.

Usage

```
sdf_rweibull(
  sc,
  n,
  shape,
  scale = 1,
  num_partitions = NULL,
  seed = NULL,
  output_col = "x"
)
```

Arguments

- **sc**: A Spark connection.
- **n**: Sample Size (default: 1000).
- **shape**: The shape of the Weibull distribution.
- **scale**: The scale of the Weibull distribution (default: 1).
- **num_partitions**: Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).
- **seed**: Random seed (default: a random long integer).
- **output_col**: Name of the output column containing sample values (default: "x").

See Also

Other Spark statistical routines: `sdf_rbeta()`, `sdf_rbinom()`, `sdf_rcauchy()`, `sdf_rchisq()`, `sdf_rexp()`, `sdf_rgamma()`, `sdf_rgeom()`, `sdf_rhyper()`, `sdf_rlnorm()`, `sdf_rnorm()`, `sdf_rpois()`, `sdf_rt()`, `sdf_runif()`
Randomly Sample Rows from a Spark DataFrame

Description

Draw a random sample of rows (with or without replacement) from a Spark DataFrame.

Usage

sdf_sample(x, fraction = 1, replacement = TRUE, seed = NULL)

Arguments

- **x**: An object coercable to a Spark DataFrame.
- **fraction**: The fraction to sample.
- **replacement**: Boolean; sample with replacement?
- **seed**: An (optional) integer seed.

Transforming Spark DataFrames

The family of functions prefixed with sdf_ generally access the Scala Spark DataFrame API directly, as opposed to the dplyr interface which uses Spark SQL. These functions will 'force' any pending SQL in a dplyr pipeline, such that the resulting tbl_spark object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the R level, these operations will only be executed when you explicitly collect() the table.

See Also

Other Spark data frames: sdf_copy_to(), sdf_distinct(), sdf_random_split(), sdf_register(), sdf_sort(), sdf_weighted_sample()

Read the Schema of a Spark DataFrame

Description

Read the schema of a Spark DataFrame.

Usage

sdf_schema(x, expand_nested_cols = FALSE, expand_struct_cols = FALSE)
sdf_separate_column

Arguments

x            A spark_connection, ml_pipeline, or a tbl_spark.
expand_nested_cols
            Whether to expand columns containing nested array of structs (which are usually
            created by tidyr::nest on a Spark data frame)
expand_struct_cols
            Whether to expand columns containing structs

Details

The type column returned gives the string representation of the underlying Spark type for that
column; for example, a vector of numeric values would be returned with the type "DoubleType".
Please see the Spark Scala API Documentation for information on what types are available and
exposed by Spark.

Value

An R list, with each list element describing the name and type of a column.

sdf_separate_column  Separate a Vector Column into Scalar Columns

Description

Given a vector column in a Spark DataFrame, split that into n separate columns, each column made
up of the different elements in the column column.

Usage

sdf_separate_column(x, column, into = NULL)

Arguments

x            A spark_connection, ml_pipeline, or a tbl_spark.
column       The name of a (vector-typed) column.
into          A specification of the columns that should be generated from column. This can
either be a vector of column names, or an R list mapping column names to the
(1-based) index at which a particular vector element should be extracted.
**sdf_seq**  
*Create DataFrame for Range*

**Description**

Creates a DataFrame for the given range

**Usage**

```r
sdf_seq(
  sc,
  from = 1L,
  to = 1L,
  by = 1L,
  repartition = NULL,
  type = c("integer", "integer64")
)
```

**Arguments**

- `sc`: The associated Spark connection.
- `from, to`: The start and end to use as a range
- `by`: The increment of the sequence.
- `repartition`: The number of partitions to use when distributing the data across the Spark cluster. Defaults to the minimum number of partitions.
- `type`: The data type to use for the index, either "integer" or "integer64".

---

**sdf_sort**  
*Sort a Spark DataFrame*

**Description**

Sort a Spark DataFrame by one or more columns, with each column sorted in ascending order.

**Usage**

```r
sdf_sort(x, columns)
```

**Arguments**

- `x`: An object coercable to a Spark DataFrame.
- `columns`: The column(s) to sort by.
Transforming Spark DataFrames

The family of functions prefixed with `sdf_` generally access the Scala Spark DataFrame API directly, as opposed to the `dplyr` interface which uses Spark SQL. These functions will 'force' any pending SQL in a `dplyr` pipeline, such that the resulting `tbl_spark` object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the R level, these operations will only be executed when you explicitly `collect()` the table.

See Also

Other Spark data frames: `sdf_copy_to()`, `sdf_distinct()`, `sdf_random_split()`, `sdf_register()`, `sdf_sample()`, `sdf_weighted_sample()`

---

`sdf_sql`  
*Spark DataFrame from SQL*

**Description**

Defines a Spark DataFrame from a SQL query, useful to create Spark DataFrames without collecting the results immediately.

**Usage**

`sdf_sql(sc, sql)`

**Arguments**

- `sc`: A `spark_connection`.
- `sql`: A ‘SQL’ query used to generate a Spark DataFrame.

---

`sdf_to_avro`  
*Convert column(s) to avro format*

**Description**

Convert column(s) to avro format

**Usage**

`sdf_to_avro(x, cols = colnames(x))`

**Arguments**

- `x`: An object coercible to a Spark DataFrame
- `cols`: Subset of Columns to convert into avro format
sdf_unnest_longer  

Description

Expand a struct column or an array column within a Spark dataframe into one or more rows, similar what to tidyr::unnest_longer does to an R dataframe. An index column, if included, will be 1-based if `col` is an array column.

Usage

```r
sdf_unnest_longer(
  data,
  col,
  values_to = NULL,
  indices_to = NULL,
  include_indices = NULL,
  names_repair = "check_unique",
  ptype = list(),
  transform = list()
)
```

Arguments

- **data**: The Spark dataframe to be unnested
- **col**: The struct column to extract components from
- **values_to**: Name of column to store vector values. Defaults to `col`.
- **indices_to**: A string giving the name of column which will contain the inner names or position (if not named) of the values. Defaults to `col` with `_id` suffix
- **include_indices**: Whether to include an index column. An index column will be included by default if `col` is a struct column. It will also be included if `indices_to` is not `NULL`.
- **names_repair**: Strategy for fixing duplicate column names (the semantic will be exactly identical to that of `.name_repair` option in tibble)
- **ptype**: Optionally, supply an R data frame prototype for the output. Each column of the unnested result will be casted based on the Spark equivalent of the type of the column with the same name within `ptype`, e.g., if `ptype` has a column `x` of type `character`, then column `x` of the unnested result will be casted from its original SQL type to StringType.
- **transform**: Optionally, a named list of transformation functions applied
## sdf_unnest_wider

### Description

Flatten a struct column within a Spark dataframe into one or more columns, similar what to tidyr::unnest_wider does to an R dataframe

### Usage

```r
defun sdf_unnest_wider(  
data,  
col,  
names_sep = NULL,  
names_repair = "check_unique",  
ptype = list(),  
transform = list()  
)
```
Arguments

- **data**: The Spark dataframe to be unnested
- **col**: The struct column to extract components from
- **names_sep**: If ‘NULL’, the default, the names will be left as is. If a string, the inner and outer names will be pasted together using ‘names_sep’ as the delimiter.
- **names_repair**: Strategy for fixing duplicate column names (the semantic will be exactly identical to that of ‘.name_repair’ option in tibble)
- **ptype**: Optionally, supply an R data frame prototype for the output. Each column of the unnested result will be casted based on the Spark equivalent of the type of the column with the same name within ‘ptype’, e.g., if ‘ptype’ has a column ‘x’ of type ‘character’, then column ‘x’ of the unnested result will be casted from its original SQL type to StringType.
- **transform**: Optionally, a named list of transformation functions applied to each component (e.g., list(‘x = as.character’) to cast column ‘x’ to String).

Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "2.4.0")

sdf <- copy_to(
  sc,
  tibble::tibble(
    x = 1:3,
    y = list(list(a = 1, b = 2), list(a = 3, b = 4), list(a = 5, b = 6))
  )
)

# flatten struct column 'y' into two separate columns 'y_a' and 'y_b'
unnested <- sdf %>% sdf_unnest_wider(y, names_sep = "_")

## End(Not run)
```

sdf_weighted_sample  
**Perform Weighted Random Sampling on a Spark DataFrame**

Description

Draw a random sample of rows (with or without replacement) from a Spark DataFrame. If the sampling is done without replacement, then it will be conceptually equivalent to an iterative process such that in each step the probability of adding a row to the sample set is equal to its weight divided by summation of weights of all rows that are not in the sample set yet in that step.
sdf_weighted_sample(x, weight_col, k, replacement = TRUE, seed = NULL)

Arguments

x An object coercable to a Spark DataFrame.
weight_col Name of the weight column
k Sample set size
replacement Whether to sample with replacement
seed An (optional) integer seed

Transforming Spark DataFrames

The family of functions prefixed with sdf_ generally access the Scala Spark DataFrame API directly, as opposed to the dplyr interface which uses Spark SQL. These functions will 'force' any pending SQL in a dplyr pipeline, such that the resulting tbl_spark object returned will no longer have the attached 'lazy' SQL operations. Note that the underlying Spark DataFrame does execute its operations lazily, so that even though the pending set of operations (currently) are not exposed at the R level, these operations will only be executed when you explicitly collect() the table.

See Also

Other Spark data frames: sdf_copy_to(), sdf_distinct(), sdf_random_split(), sdf_register(), sdf_sample(), sdf_sort()

sdf_with_sequential_id

Add a Sequential ID Column to a Spark DataFrame

Description

Add a sequential ID column to a Spark DataFrame. The Spark zipWithIndex function is used to produce these. This differs from sdf_with_unique_id in that the IDs generated are independent of partitioning.

Usage

sdf_with_sequential_id(x, id = "id", from = 1L)

Arguments

x A spark_connection, ml_pipeline, or a tbl_spark.
id The name of the column to host the generated IDs.
from The starting value of the id column
sdf_with_unique_id    Add a Unique ID Column to a Spark DataFrame

Description

Add a unique ID column to a Spark DataFrame. The Spark monotonicallyIncreasingId function is used to produce these and is guaranteed to produce unique, monotonically increasing ids; however, there is no guarantee that these IDs will be sequential. The table is persisted immediately after the column is generated, to ensure that the column is stable – otherwise, it can differ across new computations.

Usage

sdf_with_unique_id(x, id = "id")

Arguments

- x: A spark_connection, ml_pipeline, or a tbl_spark.
- id: The name of the column to host the generated IDs.

select    Select

Description

See select for more details.

separate    Separate

Description

See separate for more details.
Access the Spark API

Description
Access the commonly-used Spark objects associated with a Spark instance. These objects provide access to different facets of the Spark API.

Usage
spark_context(sc)
java_context(sc)
hive_context(sc)
spark_session(sc)

Arguments
sc A spark_connection.

Details
The Scala API documentation is useful for discovering what methods are available for each of these objects. Use `invoke` to call methods on these objects.

Spark Context
The main entry point for Spark functionality. The Spark Context represents the connection to a Spark cluster, and can be used to create RDDs, accumulators and broadcast variables on that cluster.

Java Spark Context
A Java-friendly version of the aforementioned Spark Context.

Hive Context
An instance of the Spark SQL execution engine that integrates with data stored in Hive. Configuration for Hive is read from `hive-site.xml` on the classpath.

Starting with Spark >= 2.0.0, the Hive Context class has been deprecated – it is superceded by the Spark Session class, and `hive_context` will return a Spark Session object instead. Note that both classes share a SQL interface, and therefore one can invoke SQL through these objects.
Spark Session

Available since Spark 2.0.0, the Spark Session unifies the Spark Context and Hive Context classes into a single interface. Its use is recommended over the older APIs for code targeting Spark 2.0.0 and above.

spark-connections  Manage Spark Connections

Description

These routines allow you to manage your connections to Spark.

Call `spark_disconnect()` on each open Spark connection

Usage

```r
spark_connect(
  master,
  spark_home = Sys.getenv("SPARK_HOME"),
  method = c("shell", "livy", "databricks", "test", "qubole", "synapse"),
  app_name = "sparklyr",
  version = NULL,
  config = spark_config(),
  extensions = sparklyr::registered_extensions(),
  packages = NULL,
  scala_version = NULL,
  ...
)

spark_connection_is_open(sc)

spark_disconnect(sc, ...)

spark_disconnect_all(...)

spark_submit(
  master,
  file,
  spark_home = Sys.getenv("SPARK_HOME"),
  app_name = "sparklyr",
  version = NULL,
  config = spark_config(),
  extensions = sparklyr::registered_extensions(),
  scala_version = NULL,
  ...
)
```
**Arguments**

- **master**
  Spark cluster url to connect to. Use "local" to connect to a local instance of Spark installed via `spark_install`.

- **spark_home**
  The path to a Spark installation. Defaults to the path provided by the SPARK_HOME environment variable. If SPARK_HOME is defined, it will always be used unless the version parameter is specified to force the use of a locally installed version.

- **method**
  The method used to connect to Spark. Default connection method is "shell" to connect using spark-submit, use "livy" to perform remote connections using HTTP, or "databricks" when using a Databricks clusters.

- **app_name**
  The application name to be used while running in the Spark cluster.

- **version**
  The version of Spark to use. Required for "local" Spark connections, optional otherwise.

- **config**
  Custom configuration for the generated Spark connection. See `spark_config` for details.

- **extensions**
  Extension R packages to enable for this connection. By default, all packages enabled through the use of `sparklyr::register_extension` will be passed here.

- **packages**
  A list of Spark packages to load. For example, "delta" or "kafka" to enable Delta Lake or Kafka. Also supports full versions like "io.delta:delta-core_2.11:0.4.0". This is similar to adding packages into the `sparklyr.shell.packages` configuration option. Notice that the version parameter is used to choose the correct package, otherwise assumes the latest version is being used.

- **scala_version**
  Load the sparklyr jar file that is built with the version of Scala specified (this currently only makes sense for Spark 2.4, where sparklyr will by default assume Spark 2.4 on current host is built with Scala 2.11, and therefore `scala_version = '2.12'` is needed if sparklyr is connecting to Spark 2.4 built with Scala 2.12)

- **...**
  Additional params to be passed to each `spark_disconnect()` call (e.g., `terminate = TRUE`)

- **sc**
  A `spark_connection`.

- **file**
  Path to R source file to submit for batch execution.

**Details**

By default, when using method = "livy", jars are downloaded from GitHub. But an alternative path (local to Livy server or on HDFS or HTTP(s)) to sparklyr JAR can also be specified through the `sparklyr.livy.jar` setting.

**Examples**

```r
conf <- spark_config()
conf$'sparklyr.shell.conf' <- c(
  "spark.executor.extraJavaOptions=-Duser.timezone='UTC'",
  "spark.driver.extraJavaOptions=-Duser.timezone='UTC'",
  "spark.sql.session.timeZone='UTC'"
)
```
sc <- spark_connect(
  master = "spark://HOST:PORT", config = conf
)
connection_is_open(sc)
spark_disconnect(sc)

sparklyr_get_backend_port

*Return the port number of a sparklyr backend.*

**Description**

Retrieve the port number of the sparklyr backend associated with a Spark connection.

**Usage**

`sparklyr_get_backend_port(sc)`

**Arguments**

- `sc`: A `spark_connection`.

**Value**

The port number of the sparklyr backend associated with `sc`.

---

**spark_adaptive_query_execution**

*Retrieves or sets status of Spark AQE*

**Description**

Retrieves or sets whether Spark adaptive query execution is enabled.

**Usage**

`spark_adaptive_query_execution(sc, enable = NULL)`

**Arguments**

- `sc`: A `spark_connection`.
- `enable`: Whether to enable Spark adaptive query execution. Defaults to `NULL` to retrieve configuration entries.
spark_advisory_shuffle_partition_size

See Also

Other Spark runtime configuration: spark_advisory_shuffle_partition_size(), spark_auto_broadcast_join_threshold(), spark_coalesce_initial_num_partitions(), spark_coalesce_min_num_partitions(), spark_coalesce_shuffle_partitions(), spark_session_config()

spark_advisory_shuffle_partition_size

Retrieves or sets advisory size of the shuffle partition

Description

Retrieves or sets advisory size in bytes of the shuffle partition during adaptive optimization

Usage

spark_advisory_shuffle_partition_size(sc, size = NULL)

Arguments

sc  A spark_connection.
size  Advisory size in bytes of the shuffle partition. Defaults to NULL to retrieve configuration entries.

See Also

Other Spark runtime configuration: spark_adaptive_query_execution(), spark_auto_broadcast_join_threshold(), spark_coalesce_initial_num_partitions(), spark_coalesce_min_num_partitions(), spark_coalesce_shuffle_partitions(), spark_session_config()

spark_apply

Apply an R Function in Spark

Description

Applies an R function to a Spark object (typically, a Spark DataFrame).
Usage

spark_apply(
  x,
  f,
  columns = NULL,
  memory = TRUE,
  group_by = NULL,
  packages = NULL,
  context = NULL,
  name = NULL,
  barrier = NULL,
  fetch_result_as_sdf = TRUE,
  partition_index_param = "",
  arrow_max_records_per_batch = NULL,
  auto_deps = FALSE,
  ...
)

Arguments

x
An object (usually a spark_tbl) coercable to a Spark DataFrame.

f
A function that transforms a data frame partition into a data frame. The function f has signature f(df, context, group1, group2, ...) where df is a data frame with the data to be processed, context is an optional object passed as the context parameter and group1 to groupN contain the values of the group_by values. When group_by is not specified, f takes only one argument.

Can also be an rlang anonymous function. For example, as ~ .x + 1 to define an expression that adds one to the given .x data frame.

columns
A vector of column names or a named vector of column types for the transformed object. When not specified, a sample of 10 rows is taken to infer out the output columns automatically, to avoid this performance penalty, specify the column types. The sample size is configurable using the sparklyr.apply.schema.infer configuration option.

memory
Boolean; should the table be cached into memory?

group_by
Column name used to group by data frame partitions.

packages
Boolean to distribute .libPaths() packages to each node, a list of packages to distribute, or a package bundle created with spark_apply_bundle(). Defaults to TRUE or the sparklyr.apply.packages value set in spark_config().

For clusters using Yarn cluster mode, packages can point to a package bundle created using spark_apply_bundle() and made available as a Spark file using config$sparklyr.shell.files. For clusters using Livy, packages can be manually installed on the driver node.

For offline clusters where available.packages() is not available, manually download the packages database from https://cran.r-project.org/web/packages/packages.rds and set Sys.setenv(sparklyr.apply.packagesdb = "<pathl-to-rds>"). Otherwise, all packages will be used by default.
For clusters where R packages already installed in every worker node, the `spark.r.libpaths` config entry can be set in `spark_config()` to the local packages library. To specify multiple paths collapse them (without spaces) with a comma delimiter (e.g., "/lib/path/one,/lib/path/two").

- **context** Optional object to be serialized and passed back to `f()`.
- **name** Optional table name while registering the resulting data frame.
- **barrier** Optional to support Barrier Execution Mode in the scheduler.
- **fetch_result_as_sdf** Whether to return the transformed results in a Spark DataFrame (defaults to `TRUE`). When set to `FALSE`, results will be returned as a list of R objects instead.
  
  **NOTE:** `fetch_result_as_sdf` must be set to `FALSE` when the transformation function being applied is returning R objects that cannot be stored in a Spark DataFrame (e.g., complex numbers or any other R data type that does not have an equivalent representation among Spark SQL data types).

- **partition_index_param** Optional if non-empty, then `f` also receives the index of the partition being processed as a named argument with this name, in addition to all positional argument(s) it will receive.
  
  **NOTE:** when `fetch_result_as_sdf` is set to `FALSE`, object returned from the transformation function also must be serializable by the `base::serialize` function in R.

- **arrow_max_records_per_batch** Maximum size of each Arrow record batch, ignored if Arrow serialization is not enabled.

- **auto_deps** [Experimental] Whether to infer all required R packages by examining the closure `f()` and only distribute required R and their transitive dependencies to Spark worker nodes (default: `FALSE`). **NOTE:** this option will only take effect if `packages` is set to `TRUE` or is a character vector of R package names. If `packages` is a character vector of R package names, then both the set of packages specified by packages and the set of inferred packages will be distributed to Spark workers.

- **...** Optional arguments; currently unused.

### Configuration

`spark_config()` settings can be specified to change the workers environment.

For instance, to set additional environment variables to each worker node use the `sparklyr.apply.env.*` config, to launch workers without `--vanilla` use `sparklyr.apply.options.vanilla` set to `FALSE`, to run a custom script before launching Rscript use `sparklyr.apply.options.rscript.before`.

### Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local[3]")
```
# creates an Spark data frame with 10 elements then multiply times 10 in R
sdf_len(sc, 10) %>% spark_apply(function(df) df * 10)

# using barrier mode
sdf_len(sc, 3, repartition = 3) %>%
  spark_apply(nrow, barrier = TRUE, columns = c(id = "integer")) %>%
  collect()

## End(Not run)

---

### spark_apply_bundle

**Create Bundle for Spark Apply**

**Description**

Creates a bundle of packages for `spark_apply()`.

**Usage**

```
spark_apply_bundle(packages = TRUE, base_path = getwd(), session_id = NULL)
```

**Arguments**

- `packages`: List of packages to pack or `TRUE` to pack all.
- `base_path`: Base path used to store the resulting bundle.
- `session_id`: An optional ID string to include in the bundle file name to allow the bundle to be session-specific

---

### spark_apply_log

**Log Writer for Spark Apply**

**Description**

Writes data to log under `spark_apply()`.

**Usage**

```
spark_apply_log(..., level = "INFO")
```

**Arguments**

- `...`: Arguments to write to log.
- `level`: Severity level for this entry; recommended values: INFO, ERROR or WARN.
spark_auto_broadcast_join_threshold

Retrieves or sets the auto broadcast join threshold

Description

Configures the maximum size in bytes for a table that will be broadcast to all worker nodes when performing a join. By setting this value to -1 broadcasting can be disabled. Note that currently statistics are only supported for Hive Metastore tables where the command ‘ANALYZE TABLE <tableName> COMPUTE STATISTICS noscan’ has been run, and file-based data source tables where the statistics are computed directly on the files of data.

Usage

spark_auto_broadcast_join_threshold(sc, threshold = NULL)

Arguments

sc A spark_connection.
threshold Maximum size in bytes for a table that will be broadcast to all worker nodes when performing a join. Defaults to NULL to retrieve configuration entries.

See Also

Other Spark runtime configuration: spark_adaptive_query_execution(), spark_advisory_shuffle_partition_size(), spark_coalesce_initial_num_partitions(), spark_coalesce_min_num_partitions(), spark_coalesce_shuffle_partition_size(), spark_session_config()

spark_coalesce_initial_num_partitions

Retrieves or sets initial number of shuffle partitions before coalescing

Description

Retrieves or sets initial number of shuffle partitions before coalescing

Usage

spark_coalesce_initial_num_partitions(sc, num_partitions = NULL)

Arguments

sc A spark_connection.
num_partitions Initial number of shuffle partitions before coalescing. Defaults to NULL to retrieve configuration entries.
spark_coalesce_shuffle_partitions

**See Also**

Other Spark runtime configuration: `spark_adaptive_query_execution()`, `spark_advisory_shuffle_partition_size()`, `spark_auto_broadcast_join_threshold()`, `spark_coalesce_initial_num_partitions()`, `spark_coalesce_min_num_partitions()`, `spark_coalesce_shuffle_partitions()`.

---

**spark_coalesce_min_num_partitions**

*Retrives or sets the minimum number of shuffle partitions after coalescing*

---

**Description**

Retrieves or sets the minimum number of shuffle partitions after coalescing.

**Usage**

`spark_coalesce_min_num_partitions(sc, num_partitions = NULL)`

**Arguments**

- `sc` A `spark_connection`.
- `num_partitions` Minimum number of shuffle partitions after coalescing. Defaults to `NULL` to retrieve configuration entries.

---

**spark_coalesce_shuffle_partitions**

*Retrives or sets whether coalescing contiguous shuffle partitions is enabled*

---

**Description**

Retrieves or sets whether coalescing contiguous shuffle partitions is enabled.

**Usage**

`spark_coalesce_shuffle_partitions(sc, enable = NULL)`

---
spark_compilation_spec

Define a Spark Compilation Specification

Description

For use with compile_package_jars. The Spark compilation specification is used when compiling
Spark extension Java Archives, and defines which versions of Spark, as well as which versions of
Scala, should be used for compilation.

Usage

spark_compilation_spec(
  spark_version = NULL,
  spark_home = NULL,
  scalac_path = NULL,
  scala_filter = NULL,
  jar_name = NULL,
  jar_path = NULL,
  jar_dep = NULL,
  embedded_srcs = "embedded_sources.R"
)

Arguments

spark_version The Spark version to build against. This can be left unset if the path to a suitable
Spark home is supplied.

spark_home The path to a Spark home installation. This can be left unset if spark_version
is supplied; in such a case, sparklyr will attempt to discover the associated
Spark installation using spark_home_dir.

scalac_path The path to the scalac compiler to be used during compilation of your Spark
extension. Note that you should ensure the version of scalac selected matches
the version of scalac used with the version of Spark you are compiling against.
An optional R function that can be used to filter which scala files are used during compilation. This can be useful if you have auxiliary files that should only be included with certain versions of Spark.

The name to be assigned to the generated jar.

The path to the jar tool to be used during compilation of your Spark extension.

An optional list of additional jar dependencies.

Embedded source file(s) under `<R package root>/java` to be included in the root of the resulting jar file as resources.

Details

Most Spark extensions won't need to define their own compilation specification, and can instead rely on the default behavior of `compile_package_jars`.

---

**spark_config**

*Read Spark Configuration*

**Description**

Read Spark Configuration

**Usage**

```
spark_config(file = "config.yml", use_default = TRUE)
```

**Arguments**

- `file` Name of the configuration file
- `use_default` TRUE to use the built-in defaults provided in this package

**Details**

Read Spark configuration using the `config` package.

**Value**

Named list with configuration data
spark_config_kubernetes

Kubernetes Configuration

Description

Convenience function to initialize a Kubernetes configuration instead of spark_config(), exposes common properties to set in Kubernetes clusters.

Usage

```r
spark_config_kubernetes(
  master, 
  version = "2.3.3", 
  image = "spark:sparklyr", 
  driver = random_string("sparklyr-"), 
  account = "spark", 
  jars = "local:///opt/sparklyr", 
  forward = TRUE, 
  executors = NULL, 
  conf = NULL, 
  timeout = 120, 
  ports = c(8880, 8881, 4040), 
  fix_config = identical(.Platform$OS.type, "windows"),
  ...
)
```

Arguments

- `master`: Kubernetes url to connect to, found by running `kubectl cluster-info`.
- `version`: The version of Spark being used.
- `image`: Container image to use to launch Spark and sparklyr. Also known as `spark.kubernetes.container.image`.
- `driver`: Name of the driver pod. If not set, the driver pod name is set to "sparklyr" suffixed by id to avoid name conflicts. Also known as `spark.kubernetes.driver.pod.name`.
- `account`: Service account that is used when running the driver pod. The driver pod uses this service account when requesting executor pods from the API server. Also known as `spark.kubernetes.authenticate.driver.serviceAccountName`.
- `jars`: Path to the sparklyr jars: either, a local path inside the container image with the sparklyr jars copied when the image was created or, a path accessible by the container where the sparklyr jars were copied. You can find a path to the sparklyr jars by running `system.file("java/", package = "sparklyr")`.
- `forward`: Should ports used in sparklyr be forwarded automatically through Kubernetes? Default to TRUE which runs `kubectl port-forward` and `pkill kubectl` on disconnection.
- `executors`: Number of executors to request while connecting.
conf A named list of additional entries to add to sparklyr.shell.conf.
timeout Total seconds to wait before giving up on connection.
ports Ports to forward using kubectl.
fix_config Should the spark-defaults.conf get fixed? TRUE for Windows.
... Additional parameters, currently not in use.

spark_config_packages  Creates Spark Configuration

Description

Creates Spark Configuration

Usage

spark_config_packages(config, packages, version, scala_version = NULL, ...)

Arguments

config  The Spark configuration object.
packages A list of named packages or versioned packages to add.
version  The version of Spark being used.
scala_version Acceptable Scala version of packages to be loaded
... Additional configurations

spark_config_settings  Retrieve Available Settings

Description

Retrieves available sparklyr settings that can be used in configuration files or spark_config().

Usage

spark_config_settings()
spark_connection

 Retrieve the Spark Connection Associated with an R Object

Description
Retrieve the spark_connection associated with an R object.

Usage
spark_connection(x, ...)

Arguments
x
An R object from which a spark_connection can be obtained.

... Optional arguments; currently unused.

spark_connection-class
spark_connection class

Description
spark_connection class

spark_connection_find
Find Spark Connection

Description
Finds an active spark connection in the environment given the connection parameters.

Usage
spark_connection_find(master = NULL, app_name = NULL, method = NULL)

Arguments
master The Spark master parameter.
app_name The Spark application name.
method The method used to connect to Spark.
spark_connect_method  

*Function that negotiates the connection with the Spark back-end*

**Description**

Function that negotiates the connection with the Spark back-end

**Usage**

```r
spark_connect_method(
  x, 
  method, 
  master, 
  spark_home, 
  config, 
  app_name, 
  version, 
  hadoop_version, 
  extensions, 
  scala_version, 
  ...
)
```

**Arguments**

- **x**  
  A dummy method object to determine which code to use to connect

- **method**  
  The method used to connect to Spark. Default connection method is "shell" to connect using spark-submit, use "livy" to perform remote connections using HTTP, or "databricks" when using a Databricks clusters.

- **master**  
  Spark cluster url to connect to. Use "local" to connect to a local instance of Spark installed via `spark_install`.

- **spark_home**  
  The path to a Spark installation. Defaults to the path provided by the SPARK_HOME environment variable. If SPARK_HOME is defined, it will always be used unless the version parameter is specified to force the use of a locally installed version.

- **config**  
  Custom configuration for the generated Spark connection. See `spark_config` for details.

- **app_name**  
  The application name to be used while running in the Spark cluster.

- **version**  
  The version of Spark to use. Required for "local" Spark connections, optional otherwise.

- **hadoop_version**  
  Version of Hadoop to use

- **extensions**  
  Extension R packages to enable for this connection. By default, all packages enabled through the use of `sparklyr::register_extension` will be passed here.
Load the sparklyr jar file that is built with the version of Scala specified (this currently only makes sense for Spark 2.4, where sparklyr will by default assume Spark 2.4 on current host is built with Scala 2.11, and therefore `scala_version = '2.12'` is needed if sparklyr is connecting to Spark 2.4 built with Scala 2.12)

... Additional params to be passed to each `spark_disconnect()` call (e.g., `terminate = TRUE`)

---

**Description**

Retrieves the runtime configuration interface for the Spark Context.

**Usage**

```r
spark_context_config(sc)
```

**Arguments**

- `sc`: A `spark_connection`.

---

**spark_dataframe**

*Retrieve a Spark DataFrame*

**Description**

This S3 generic is used to access a Spark DataFrame object (as a Java object reference) from an R object.

**Usage**

```r
spark_dataframe(x, 
```

**Arguments**

- `x`: An R object wrapping, or containing, a Spark DataFrame.
- `...`: Optional arguments; currently unused.

**Value**

A `spark_jobj` representing a Java object reference to a Spark DataFrame.
spark_default_compilation_spec

Default Compilation Specification for Spark Extensions

Description

This is the default compilation specification used for Spark extensions, when used with `compile_package_jars`.

Usage

```
spark_default_compilation_spec(
    pkg = infer_active_package_name(),
    locations = NULL
)
```

Arguments

- **pkg**: The package containing Spark extensions to be compiled.
- **locations**: Additional locations to scan. By default, the directories `/opt/scala` and `/usr/local/scala` will be scanned.

spark_dependency

Define a Spark dependency

Description

Define a Spark dependency consisting of a set of custom JARs, Spark packages, and customized dbplyr SQL translation env.

Usage

```
spark_dependency(
    jars = NULL,
    packages = NULL,
    initializer = NULL,
    catalog = NULL,
    repositories = NULL,
    dbplyr_sql_variant = NULL,
    ...
)
```
spark_dependency_fallback

Description

Helper function to assist falling back to previous Spark versions.

Usage

spark_dependency_fallback(spark_version, supported_versions)

Arguments

spark_version
  The Spark version being requested in spark_dependencies.

supported_versions
  The Spark versions that are supported by this extension.

Value

A Spark version to use.
spark_extension  

Create Spark Extension

Description

Creates an R package ready to be used as an Spark extension.

Usage

spark_extension(path)

Arguments

path  
Location where the extension will be created.

spark_home_set  

Set the SPARK_HOME environment variable

Description

Set the SPARK_HOME environment variable. This slightly speeds up some operations, including the connection time.

Usage

spark_home_set(path = NULL, ...)

Arguments

path  
A string containing the path to the installation location of Spark. If NULL, the path to the most latest Spark/Hadoop versions is used.

...  
Additional parameters not currently used.

Value

The function is mostly invoked for the side-effect of setting the SPARK_HOME environment variable. It also returns TRUE if the environment was successfully set, and FALSE otherwise.

Examples

## Not run:
# Not run due to side-effects
spark_home_set()

## End(Not run)
spark_ide_connection_open

Set of functions to provide integration with the RStudio IDE

Description

Set of functions to provide integration with the RStudio IDE

Usage

spark_ide_connection_open(con, env, connect_call)

spark_ide_connection_closed(con)

spark_ide_connection_updated(con, hint)

spark_ide_connection_actions(con)

spark_ide_objects(con, catalog, schema, name, type)

spark_ide_columns(
  con,
  table = NULL,
  view = NULL,
  catalog = NULL,
  schema = NULL
)

spark_ide_preview(
  con,
  rowLimit,
  table = NULL,
  view = NULL,
  catalog = NULL,
  schema = NULL
)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>con</td>
<td>Valid Spark connection</td>
</tr>
<tr>
<td>env</td>
<td>R environment of the interactive R session</td>
</tr>
<tr>
<td>connect_call</td>
<td>R code that can be used to re-connect to the Spark connection</td>
</tr>
<tr>
<td>hint</td>
<td>Name of the Spark connection that the RStudio IDE can use as reference.</td>
</tr>
<tr>
<td>catalog</td>
<td>Name of the top level of the requested table or view</td>
</tr>
<tr>
<td>schema</td>
<td>Name of the second most top level of the requested level or view</td>
</tr>
</tbody>
</table>
name  The new name of the view or table being requested

type  Type of the object being requested, 'view' or 'table'

table  Name of the requested table

Details

These functions are meant for downstream packages, that provide additional backends to 'sparklyr', to override the opening, closing, update, and preview functionality. The arguments are driven by what the RStudio IDE API expects them to be, so this is the reason why some use 'type' to designate views or tables, and others have one argument for 'table', and another for 'view'.

spark_insert_table

Inserts a Spark DataFrame into a Spark table

Description

Inserts a Spark DataFrame into a Spark table.

Usage

spark_insert_table(
  x,
  name,
  mode = NULL,
  overwrite = FALSE,
  options = list(),
  ...
)

Arguments

x  A Spark DataFrame or dplyr operation

name  The name to assign to the newly generated table.

mode  A character element. Specifies the behavior when data or table already exists. Supported values include: ‘error’, ‘append’, ‘overwrite’ and ignore. Notice that 'overwrite' will also change the column structure. For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.

overwrite  Boolean; overwrite the table with the given name if it already exists?

options  A list of strings with additional options.

...  Optional arguments; currently unused.
spark_install

Download and install various versions of Spark

Description

Install versions of Spark for use with local Spark connections (i.e. `spark_connect(master = "local")`)

Usage

```r
spark_install(
  version = NULL,
  hadoop_version = NULL,
  reset = TRUE,
  logging = "INFO",
  verbose = interactive()
)

spark_uninstall(version, hadoop_version)

spark_install_dir()

spark_install_tar(tarfile)

spark_installed_versions()

spark_available_versions(
  show_hadoop = FALSE,
  show_minor = FALSE,
  show_future = FALSE
)
```

Arguments

- **version**: Version of Spark to install. See `spark_available_versions` for a list of supported versions
- **hadoop_version**: Version of Hadoop to install. See `spark_available_versions` for a list of supported versions
reset Attempts to reset settings to defaults.
logging Logging level to configure install. Supported options: "WARN", "INFO"
verbose Report information as Spark is downloaded / installed
tarfile Path to TAR file conforming to the pattern spark-###-bin-(hadoop)?### where ### reference spark and hadoop versions respectively.
show_hadoop Show Hadoop distributions?
show_minor Show minor Spark versions?
show_future Should future versions which have not been released be shown?

Value
List with information about the installed version.

spark_integ_test_skip It lets the package know if it should test a particular functionality or not

Description
It lets the package know if it should test a particular functionality or not

Usage
spark_integ_test_skip(sc, test_name)

Arguments
sc Spark connection
test_name The name of the test

Details
It expects a boolean to be returned. If TRUE, the corresponding test will be skipped. If FALSE the test will be conducted.
**spark_job**  
*Retrieve a Spark JVM Object Reference*

**Description**

This S3 generic is used for accessing the underlying Java Virtual Machine (JVM) Spark objects associated with R objects. These objects act as references to Spark objects living in the JVM. Methods on these objects can be called with the `invoke` family of functions.

**Usage**

```
spark_job(x, ...)  
```

**Arguments**

- `x`  
  An R object containing, or wrapping, a `spark_job`.

- `...`  
  Optional arguments; currently unused.

**See Also**

- `invoke`, for calling methods on Java object references.

---

**spark_job-class**  
*spark_job class*

**Description**

`spark_job class`

---

**spark_last_error**  
*Surfaces the last error from Spark captured by internal `spark_error` function*

**Description**

Surfaces the last error from Spark captured by internal `spark_error` function.

**Usage**

```
spark_last_error()  
```
spark_load_table

Reads from a Spark Table into a Spark DataFrame.

Description

Reads from a Spark Table into a Spark DataFrame.

Usage

spark_load_table(
  sc,
  name,
  path,
  options = list(),
  repartition = 0,
  memory = TRUE,
  overwrite = TRUE
)

Arguments

sc A spark_connection.

name The name to assign to the newly generated table.

path The path to the file. Needs to be accessible from the cluster. Supports the
      "hdfs://", "s3a://" and "file://" protocols.

options A list of strings with additional options. See https://spark.apache.org/
         docs/latest/sql-programming-guide.html#configuration.

repartition The number of partitions used to distribute the generated table. Use 0 (the
default) to avoid partitioning.

memory Boolean; should the data be loaded eagerly into memory? (That is, should the
         table be cached?)

overwrite Boolean; overwrite the table with the given name if it already exists?

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_read_avro(),
spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(), spark_read_jdbc(),
spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(), spark_read_source(),
spark_read_table(), spark_read_text(), spark_read(), spark_save_table(), spark_write_avro(),
spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(),
spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
**spark_log**

*View Entries in the Spark Log*

**Description**

View the most recent entries in the Spark log. This can be useful when inspecting output / errors produced by Spark during the invocation of various commands.

**Usage**

```r
glitch(sc, n = 100, filter = NULL, ...)
```

**Arguments**

- `sc` A spark_connection.
- `n` The max number of log entries to retrieve. Use NULL to retrieve all entries within the log.
- `filter` Character string to filter log entries.
- `...` Optional arguments; currently unused.

**spark_read**

*Read file(s) into a Spark DataFrame using a custom reader*

**Description**

Run a custom R function on Spark workers to ingest data from one or more files into a Spark DataFrame, assuming all files follow the same schema.

**Usage**

```r
glitch(sc, paths, reader, columns, packages = TRUE, ...)
```

**Arguments**

- `sc` A spark_connection.
- `paths` A character vector of one or more file URIs (e.g., `c("hdfs://localhost:9000/file.txt", "hdfs://localhost:9000/file2.txt")`)
- `reader` A self-contained R function that takes a single file URI as argument and returns the data read from that file as a data frame.
- `columns` A named list of column names and column types of the resulting data frame (e.g., `list(column_1 = "integer", column_2 = "character")`), or a list of column names only if column types should be inferred from the data (e.g., `list("column_1", "column_2")`), or NULL if column types should be inferred and resulting data frame can have arbitrary column names
- `packages` A list of R packages to distribute to Spark workers
- `...` Optional arguments; currently unused.
See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(),
spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(),
spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(),
spark_read_source(), spark_read_table(), spark_read_text(), spark_save_table(), spark_write_avro(),
spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(),
spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()

Examples

## Not run:

```r
library(sparklyr)
sc <- spark_connect(
  master = "yarn",
  spark_home = "/spark/spark-2.4.5-bin-hadoop2.7"
)

# This is a contrived example to show reader tasks will be distributed across
# all Spark worker nodes
spark_read(  
  sc,  
  rep("/dev/null", 10),  
  reader = function(path) system("hostname", intern = TRUE),  
  columns = c(hostname = "string")
) %>% sdf_collect()

## End(Not run)
```

---

### spark_read_avro

Read Apache Avro data into a Spark DataFrame.

#### Description

Read Apache Avro data into a Spark DataFrame. Notice this functionality requires the Spark connection `sc` to be instantiated with either an explicitly specified Spark version (i.e., `spark_connect(..., version = <version>, packages = c("avro", <other package(s)>), ...)`) or a specific version of Spark avro package to use (e.g., `spark_connect(..., packages = c("org.apache.spark:spark-avro_2.12:3.0.0", <other package(s)>), ...)`).

#### Usage

```r
spark_read_avro(  
  sc,  
  name = NULL,  
  path = name,  
  avro_schema = NULL,
```
spark_read_binary

ignore_extension = TRUE,
repartition = 0,
memory = TRUE,
overwrite = TRUE
)

Arguments

sc
A spark_connection.

name
The name to assign to the newly generated table.

path
The path to the file. Needs to be accessible from the cluster. Supports the
"hdfs://", "s3a://" and "file:///" protocols.

avro_schema
Optional Avro schema in JSON format

ignore_extension
If enabled, all files with and without .avro extension are loaded (default: TRUE)

repartition
The number of partitions used to distribute the generated table. Use 0 (the de-
fault) to avoid partitioning.

memory
Boolean; should the data be loaded eagerly into memory? (That is, should the
table be cached?)

overwrite
Boolean; overwrite the table with the given name if it already exists?

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(),
spark_load_table(), spark_read_binary(), spark_read_csv(), spark_read_delta(),
spark_read_image(), spark_read_jdbc(),
spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(),
spark_read_source(), spark_read_table(), spark_read_text(),
spark_read(), spark_save_table(), spark_write_avro(),
spark_write_csv(), spark_write_delta(),
spark_write_jdbc(), spark_write_json(),
spark_write_orc(),
spark_write_parquet(), spark_write_source(),
spark_write_table(), spark_write_text()

spark_read_binary

Read binary data into a Spark DataFrame.

Description

Read binary files within a directory and convert each file into a record within the resulting Spark
dataframe. The output will be a Spark dataframe with the following columns and possibly partition
columns:

- path: StringType
- modificationTime: TimestampType
- length: LongType
- content: BinaryType
Usage

```r
spark_read_binary(
    sc,
    name = NULL,
    dir = name,
    path_glob_filter = "*",
    recursive_file_lookup = FALSE,
    repartition = 0,
    memory = TRUE,
    overwrite = TRUE
)
```

Arguments

- **sc**: A spark_connection.
- **name**: The name to assign to the newly generated table.
- **dir**: Directory to read binary files from.
- **path_glob_filter**: Glob pattern of binary files to be loaded (e.g., "*.jpg").
- **recursive_file_lookup**: If FALSE (default), then partition discovery will be enabled (i.e., if a partition naming scheme is present, then partitions specified by subdirectory names such as "date=2019-07-01" will be created and files outside subdirectories following a partition naming scheme will be ignored). If TRUE, then all nested directories will be searched even if their names do not follow a partition naming scheme.
- **repartition**: The number of partitions used to distribute the generated table. Use 0 (the default) to avoid partitioning.
- **memory**: Boolean; should the data be loaded eagerly into memory? (That is, should the table be cached?)
- **overwrite**: Boolean; overwrite the table with the given name if it already exists?

See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`,
Read a CSV file into a Spark DataFrame

Description

Read a tabular data file into a Spark DataFrame.

Usage

```
spark_read_csv(
  sc,  # A spark_connection.
  name = NULL,  # The name to assign to the newly generated table.
  path = name,  # The path to the file. Needs to be accessible from the cluster. Supports the 'hdfs://', 's3a://' and 'file://' protocols.
  header = TRUE,  # Boolean; should the first row of data be used as a header? Defaults to TRUE.
  columns = NULL,  # A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
  infer_schema = is.null(columns),  # Boolean; should column types be automatically inferred? Requires one extra pass over the data. Defaults to is.null(columns).
  delimiter = ",",  # The character used to delimit each column. Defaults to ",",.
  quote = "\",  # The character used as a quote. Defaults to ",".
  escape = "\",  # The character used to escape other characters. Defaults to "\".
  charset = "UTF-8",  # The character set to use when parsing the delimiter.
  null_value = NULL,  # The value to use for null values.
  options = list(),  # Additional options to pass to the underlying implementation.
  repartition = 0,  # The number of partitions to use. Defaults to 0.
  memory = TRUE,  # Should the data be stored in memory? Defaults to TRUE.
  overwrite = TRUE  # Whether to overwrite an existing table.
)
```

Arguments

- **sc** A spark_connection.
- **name** The name to assign to the newly generated table.
- **path** The path to the file. Needs to be accessible from the cluster. Supports the 'hdfs://', 's3a://' and 'file://' protocols.
- **header** Boolean; should the first row of data be used as a header? Defaults to TRUE.
- **columns** A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
- **infer_schema** Boolean; should column types be automatically inferred? Requires one extra pass over the data. Defaults to is.null(columns).
- **delimiter** The character used to delimit each column. Defaults to ",".
- **quote** The character used as a quote. Defaults to "".
- **escape** The character used to escape other characters. Defaults to "\"."
spark_read_delta

Read from Delta Lake into a Spark DataFrame.

Description

Read from Delta Lake into a Spark DataFrame.

Usage

spark_read_delta(
    sc,
    path,
    name = NULL,
    version = NULL,
    charset = "UTF-8",
    null_value = NULL,
    options = NULL,
    repartition = NULL,
    memory = FALSE,
    overwrite = FALSE,
    ...)
spark_read_image

Read image data into a Spark DataFrame.

Description

Read image files within a directory and convert each file into a record within the resulting Spark dataframe. The output will be a Spark dataframe consisting of struct types containing the following attributes:

- origin: StringType
- height: IntegerType
• width: IntegerType
• nChannels: IntegerType
• mode: IntegerType
• data: BinaryType

Usage

spark_read_image(
    sc,
    name = NULL,
    dir = name,
    drop_invalid = TRUE,
    repartition = 0,
    memory = TRUE,
    overwrite = TRUE
)

Arguments

sc A spark_connection.
name The name to assign to the newly generated table.
dir Directory to read binary files from.
drop_invalid Whether to drop files that are not valid images from the result (default: TRUE).
repartition The number of partitions used to distribute the generated table. Use 0 (the default) to avoid partitioning.
memory Boolean; should the data be loaded eagerly into memory? (That is, should the table be cached?)
overwrite Boolean; overwrite the table with the given name if it already exists?

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(), spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(), spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(), spark_write_avro(), spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(), spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
spark_read_jdbc

Read from JDBC connection into a Spark DataFrame.

Description

Read from JDBC connection into a Spark DataFrame.

Usage

spark_read_jdbc(
  sc,
  name,
  options = list(),
  repartition = 0,
  memory = TRUE,
  overwrite = TRUE,
  columns = NULL,
  ...)

Arguments

  sc    A spark_connection.
  name  The name to assign to the newly generated table.
  options A list of strings with additional options. See https://spark.apache.org/docs/latest/sql-programming-guide.html#configuration.
  repartition The number of partitions used to distribute the generated table. Use 0 (the default) to avoid partitioning.
  memory Boolean; should the data be loaded eagerly into memory? (That is, should the table be cached?)
  overwrite Boolean; overwrite the table with the given name if it already exists?
  columns A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
  ... Optional arguments; currently unused.

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(), spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(), spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(), spark_write_avro(), spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(), spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
spark_read_json

Read a JSON file into a Spark DataFrame

Description

Read a table serialized in the JavaScript Object Notation format into a Spark DataFrame.

Usage

spark_read_json(
  sc,  
  name = NULL,  
  path = name,  
  options = list(),  
  repartition = 0,  
  memory = TRUE,  
  overwrite = TRUE,  
  columns = NULL,  
  ...
)

Arguments

sc          A spark_connection.
name        The name to assign to the newly generated table.
spark_read_libsvm

Read libsvm file into a Spark DataFrame.

Description

Read libsvm file into a Spark DataFrame.
Usage

```
spark_read_libsvm(
  sc,
  name = NULL,
  path = name,
  repartition = 0,
  memory = TRUE,
  overwrite = TRUE,
  options = list(),
  ...
)
```

Arguments

- **sc**: A spark_connection.
- **name**: The name to assign to the newly generated table.
- **path**: The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **repartition**: The number of partitions used to distribute the generated table. Use 0 (the default) to avoid partitioning.
- **memory**: Boolean; should the data be loaded eagerly into memory? (That is, should the table be cached?)
- **overwrite**: Boolean; overwrite the table with the given name if it already exists?
- **options**: A list of strings with additional options.
- **...**: Optional arguments; currently unused.

See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_binary()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_json()`, `spark_write_orc()`, `spark_write_parquet()`, `spark_write_source()`, `spark_write_table()`, `spark_write_text()`

---

### spark_read_orc

**Read a ORC file into a Spark DataFrame**

Description

Read a ORC file into a Spark DataFrame.
spark_read_orc

Usage

spark_read_orc(
  sc,
  name = NULL,
  path = name,
  options = list(),
  repartition = 0,
  memory = TRUE,
  overwrite = TRUE,
  columns = NULL,
  schema = NULL,
  ...
)

Arguments

sc  A spark_connection.
name  The name to assign to the newly generated table.
path  The path to the file. Needs to be accessible from the cluster. Supports the “hdfs://”, “s3a://” and “file://” protocols.
options  A list of strings with additional options. See https://spark.apache.org/docs/latest/sql-programming-guide.html#configuration.
repartition  The number of partitions used to distribute the generated table. Use 0 (the default) to avoid partitioning.
memory  Boolean; should the data be loaded eagerly into memory? (That is, should the table be cached?)
overwrite  Boolean; overwrite the table with the given name if it already exists?
columns  A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
schema  A (java) read schema. Useful for optimizing read operation on nested data.
...  Optional arguments; currently unused.

Details

You can read data from HDFS (hdfs://), S3 (s3a://), as well as the local file system (file://).

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(), spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(), spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_parquet(), spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(), spark_write_avro(), spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(), spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
spark_read_parquet

Read a Parquet file into a Spark DataFrame

Description

Read a Parquet file into a Spark DataFrame.

Usage

spark_read_parquet(
  sc,
  name = NULL,
  path = name,
  options = list(),
  repartition = 0,
  memory = TRUE,
  overwrite = TRUE,
  columns = NULL,
  schema = NULL,
  ...
)

Arguments

sc            A spark_connection.
name          The name to assign to the newly generated table.
path          The path to the file. Needs to be accessible from the cluster. Supports the
              "hdfs://", "s3a://" and "file://" protocols.
options        A list of strings with additional options. See https://spark.apache.org/
                docs/latest/sql-programming-guide.html#configuration.
repartition    The number of partitions used to distribute the generated table. Use 0 (the
default) to avoid partitioning.
memory         Boolean; should the data be loaded eagerly into memory? (That is, should the
table be cached?)
overwrite      Boolean; overwrite the table with the given name if it already exists?
columns        A vector of column names or a named vector of column types. If specified,
                the elements can be "binary" for BinaryType, "boolean" for BooleanType,
                "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType,
                "double" for DoubleType, "character" for StringType, "timestamp" for
                TimestampType and "date" for DateType.
schema         A (java) read schema. Useful for optimizing read operation on nested data.
...             Optional arguments; currently unused.
Details
You can read data from HDFS (hdfs://), S3 (s3a://), as well as the local file system (file://). If you are reading from a secure S3 bucket be sure to set the following in your spark-defaults.conf spark.hadoop.fs.s3a.access.key, spark.hadoop.fs.s3a.secret.key or any of the methods outlined in the aws-sdk documentation Working with AWS credentials In order to work with the newer s3a:// protocol also set the values for spark.hadoop.fs.s3a.impl and spark.hadoop.fs.s3a.endpoint. In addition, to support v4 of the S3 api be sure to pass the -Dcom.amazonaws.services.s3.enableV4 driver options for the config key spark.driver.extraJavaOptions For instructions on how to configure s3n:// check the hadoop documentation: s3n authentication properties

See Also
Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(), spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(), spark_read_jdbc(), spark_read_json(), spark_read_librsvm(), spark_read_orc(), spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(), spark_write_avro(), spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(), spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()

---

spark_read_source Read from a generic source into a Spark DataFrame.

Description
Read from a generic source into a Spark DataFrame.

Usage

    spark_read_source(
        sc,
        name = NULL,
        path = name,
        source,
        options = list(),
        repartition = 0,
        memory = TRUE,
        overwrite = TRUE,
        columns = NULL,
        ...
    )

Arguments

sc A spark_connection.

name The name to assign to the newly generated table.
spark_read_table

Reads from a Spark Table into a Spark DataFrame.

Description

Reads from a Spark Table into a Spark DataFrame.

Usage

```r
spark_read_table(
  sc,
  name,
  options = list(),
  repartition = 0,
  memory = TRUE,
  columns = NULL,
  ...
)
```
spark_read_text

Read a Text file into a Spark DataFrame

Description

Read a text file into a Spark DataFrame.

Usage

spark_read_text(
  sc,
  name = NULL,
  path = name,
  repartition = 0,
  memory = TRUE,
  overwrite = TRUE,
  options = list(),
  whole = FALSE,
  ...
)
**spark_save_table**

Saves a Spark DataFrame as a Spark table.

**Description**

Saves a Spark DataFrame as a Spark table.

**Usage**

```r
spark_save_table(x, path, mode = NULL, options = list())
```
spark_session_config

Arguments

x A Spark DataFrame or dplyr operation
path The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
mode A character element. Specifies the behavior when data or table already exists. Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that 'overwrite' will also change the column structure. For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.
options A list of strings with additional options.

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(), spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(), spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(), spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_write_avro().
spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(),
spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()

spark_session_config Runtime configuration interface for the Spark Session

Description

Retrieves or sets runtime configuration entries for the Spark Session

Usage

spark_session_config(sc, config = TRUE, value = NULL)

Arguments

sc A spark_connection.
config The configuration entry name(s) (e.g., "spark.sql.shuffle.partitions"). Defaults to NULL to retrieve all configuration entries.
value The configuration value to be set. Defaults to NULL to retrieve configuration entries.

See Also

Other Spark runtime configuration: spark_adaptive_query_execution(), spark_advisory_shuffle_partition_size(),
spark_auto_broadcast_join_threshold(), spark_coalesce_initial_num_partitions(), spark_coalesce_min_num_partitions(),
spark_coalesce_shuffle_partitions()
**spark_statistical_routines**

*Generate random samples from some distribution*

**Description**

Generator methods for creating single-column Spark dataframes comprised of i.i.d. samples from some distribution.

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sc</code></td>
<td>A Spark connection.</td>
</tr>
<tr>
<td><code>n</code></td>
<td>Sample Size (default: 1000).</td>
</tr>
<tr>
<td><code>num_partitions</code></td>
<td>Number of partitions in the resulting Spark dataframe (default: default parallelism of the Spark cluster).</td>
</tr>
<tr>
<td><code>seed</code></td>
<td>Random seed (default: a random long integer).</td>
</tr>
<tr>
<td><code>output_col</code></td>
<td>Name of the output column containing sample values (default: &quot;x&quot;).</td>
</tr>
</tbody>
</table>

**spark_table_name**

*Generate a Table Name from Expression*

**Description**

Attempts to generate a table name from an expression; otherwise, assigns an auto-generated generic name with "sparklyr_" prefix.

**Usage**

`spark_table_name(expr)`

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>expr</code></td>
<td>The expression to attempt to use as name</td>
</tr>
</tbody>
</table>
**spark_version**  
*Get the Spark Version Associated with a Spark Connection*

**Description**
Retrieve the version of Spark associated with a Spark connection.

**Usage**
```
spark_version(sc)
```

**Arguments**
- `sc`  
  A `spark_connection`.

**Details**
Suffixes for e.g. preview versions, or snapshotted versions, are trimmed – if you require the full Spark version, you can retrieve it with `invoke(spark_context(sc), "version")`.

**Value**
The Spark version as a `numeric_version`.

---

**spark_version_from_home**  
*Get the Spark Version Associated with a Spark Installation*

**Description**
Retrieve the version of Spark associated with a Spark installation.

**Usage**
```
spark_version_from_home(spark_home, default = NULL)
```

**Arguments**
- `spark_home`  
  The path to a Spark installation.
- `default`  
  The default version to be inferred, in case version lookup failed, e.g. no Spark installation was found at `spark_home`. 


### spark_web

**Open the Spark web interface**

**Description**

Open the Spark web interface

**Usage**

```r
spark_web(sc, ...)
```

**Arguments**

- `sc`: A `spark_connection`
- `...`: Optional arguments; currently unused.

### spark_write

**Write Spark DataFrame to file using a custom writer**

**Description**

Run a custom R function on Spark worker to write a Spark DataFrame into file(s). If Spark’s speculative execution feature is enabled (i.e., ‘spark.speculation’ is true), then each write task may be executed more than once and the user-defined writer function will need to ensure no concurrent writes happen to the same file path (e.g., by appending UUID to each file name).

**Usage**

```r
spark_write(x, writer, paths, packages = NULL)
```

**Arguments**

- `x`: A Spark Dataframe to be saved into file(s)
- `writer`: A writer function with the signature `function(partition, path)` where `partition` is a R dataframe containing all rows from one partition of the original Spark Dataframe `x` and `path` is a string specifying the file to write `partition` to
- `paths`: A single destination path or a list of destination paths, each one specifying a location for a partition from `x` to be written to. If number of partition(s) in `x` is not equal to `length(paths)` then `x` will be re-partitioned to contain `length(paths)` partition(s)
- `packages`: Boolean to distribute `.libPaths()` packages to each node, a list of packages to distribute, or a package bundle created with
Examples

## Not run:

library(sparklyr)

sc <- spark_connect(master = "local[3]"

# copy some test data into a Spark Dataframe
sdf <- sdf_copy_to(sc, iris, overwrite = TRUE)

# create a writer function
writer <- function(df, path) {
  write.csv(df, path)
}

spark_write(
  sdf,
  writer,
  # re-partition sdf into 3 partitions and write them to 3 separate files
  paths = list("file:///tmp/file1", "file:///tmp/file2", "file:///tmp/file3"),
)

spark_write(
  sdf,
  writer,
  # save all rows into a single file
  paths = list("file:///tmp/all_rows")
)

## End(Not run)

---

**spark_write_avro**  
Serialize a Spark DataFrame into Apache Avro format

**Description**

Serialize a Spark DataFrame into Apache Avro format. Notice this functionality requires the Spark connection sc to be instantiated with either an explicitly specified Spark version (i.e., `spark_connect(..., version = <version>, packages = c("avro", <other package(s)>), ...)`) or a specific version of Spark avro package to use (e.g., `spark_connect(..., packages = c("org.apache.spark:spark-avro_2.12:3.0.0", <other package(s)>), ...)`).

**Usage**

```r
spark_write_avro(
  x,
  path,
  avro_schema = NULL,
)```
spark_write_csv

Write a Spark DataFrame to a CSV

Description
Write a Spark DataFrame to a tabular (typically, comma-separated) file.

Usage
spark_write_csv(
  x,
  path,
  header = TRUE,
  delimiter = " ",
  quote = "\"",
  escape = "\"",
  charset = "UTF-8",
  null_value = NULL,
)

Arguments
x
A Spark DataFrame or dplyr operation
path
The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
avro_schema
Optional Avro schema in JSON format
record_name
Optional top level record name in write result (default: "topLevelRecord")
record_namespace
Record namespace in write result (default: "")
compression
Compression codec to use (default: "snappy")
partition_by
A character vector. Partitions the output by the given columns on the file system.

See Also
Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(),
spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(),
spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(),
spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(),
spark_write_csv(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(),
spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
spark_write_delta

options = list(),
mode = NULL,
partition_by = NULL,
...
)

Arguments

x
A Spark DataFrame or dplyr operation

path
The path to the file. Needs to be accessible from the cluster. Supports the
"hdfs://", "s3a://" and "file://" protocols.

header
Should the first row of data be used as a header? Defaults to TRUE.

delimiter
The character used to delimit each column, defaults to .

quote
The character used as a quote. Defaults to "".

escape
The character used to escape other characters, defaults to \.

charset
The character set, defaults to "UTF-8".

null_value
The character to use for default values, defaults to NULL.

options
A list of strings with additional options.

mode
A character element. Specifies the behavior when data or table already exists.
Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that
'overwrite' will also change the column structure.

For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.

partition_by
A character vector. Partitions the output by the given columns on the file
system.

... Optional arguments; currently unused.

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(),
spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(),
spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(),
spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(),
spark_write_avro(), spark_write_delta(), spark_write_jdbc(), spark_write_json(), spark_write_orc(),
spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()
Usage

spark_write_delta(
  x,
  path,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...
)

Arguments

x  A Spark DataFrame or dplyr operation
path The path to the file. Needs to be accessible from the cluster. Supports the
     "hdfs://", "s3a://" and "file://" protocols.
mode A character element. Specifies the behavior when data or table already exists.
     Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that
     'overwrite' will also change the column structure.
     For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.
options A list of strings with additional options.
partition_by A character vector. Partitions the output by the given columns on the file
system.
... Optional arguments; currently unused.

See Also

Other Spark serialization routines: collect_from_rds(), spark_insert_table(), spark_load_table(),
spark_read_avro(), spark_read_binary(), spark_read_csv(), spark_read_delta(), spark_read_image(),
spark_read_jdbc(), spark_read_json(), spark_read_libsvm(), spark_read_orc(), spark_read_parquet(),
spark_read_source(), spark_read_table(), spark_read_text(), spark_read(), spark_save_table(),
spark_write_avro(), spark_write_csv(), spark_write_jdbc(), spark_write_json(), spark_write_orc(),
spark_write_parquet(), spark_write_source(), spark_write_table(), spark_write_text()

spark_write_jdbc  Writes a Spark DataFrame into a JDBC table

Description

Writes a Spark DataFrame into a JDBC table.
Usage

spark_write_jdbc(
  x,
  name,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...
)

Arguments

- **x**: A Spark DataFrame or dplyr operation
- **name**: The name to assign to the newly generated table.
- **mode**: A character element. Specifies the behavior when data or table already exists. Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that 'overwrite' will also change the column structure. For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.
- **options**: A list of strings with additional options.
- **partition_by**: A character vector. Partitions the output by the given columns on the file system.
- **...**: Optional arguments; currently unused.

See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_json()`, `spark_write_orc()`, `spark_write_parquet()`, `spark_write_source()`, `spark_write_table()`, `spark_write_text()`

Examples

```r
## Not run:
sc <- spark_connect(
  master = "local",
  config = list(
    "sparklyr.shell.driver-class-path" = "/usr/share/java/mysql-connector-java-8.0.25.jar"
  )
)
spark_write_jdbc(
  sdf_len(sc, 10),
  name = "my_sql_table",
  options = list(
    url = "jdbc:mysql://localhost:3306/my_sql_schema",
    driver = "com.mysql.jdbc.Driver",
```
spark_write_json

Write a Spark DataFrame to a JSON file

Description

Serialize a Spark DataFrame to the JavaScript Object Notation format.

Usage

spark_write_json(
  x,
  path,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...
)

Arguments

x  A Spark DataFrame or dplyr operation

path  The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.

mode  A character element. Specifies the behavior when data or table already exists. Supported values include: ‘error’, ‘append’, ‘overwrite’ and ignore. Notice that 'overwrite' will also change the column structure.

For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.

options  A list of strings with additional options.

partition_by  A character vector. Partitions the output by the given columns on the file system.

...  Optional arguments; currently unused.
spark_write_orc

See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_orc()`, `spark_write_parquet()`, `spark_write_source()`, `spark_write_table()`.

---

**Description**

Serialize a Spark DataFrame to the **ORC** format.

**Usage**

```r
spark_write_orc(
  x,
  path,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...
)
```

**Arguments**

- **x**: A Spark DataFrame or dplyr operation.
- **path**: The path to the file. Needs to be accessible from the cluster. Supports the “hdfs://”, “s3a://” and “file://” protocols.
- **mode**: A character element. Specifies the behavior when data or table already exists. Supported values include: ‘error’, ‘append’, ‘overwrite’ and ignore. Notice that ‘overwrite’ will also change the column structure. For more details see also [https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes](https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes) for your version of Spark.
- **options**: A list of strings with additional options. See [https://spark.apache.org/docs/latest/sql-programming-guide.html#configuration](https://spark.apache.org/docs/latest/sql-programming-guide.html#configuration).
- **partition_by**: A character vector. Partitions the output by the given columns on the file system.
- **...**: Optional arguments; currently unused.
See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_json()`, `spark_write_parquet()`, `spark_write_source()`, `spark_write_table()`, `spark_write_text()`

## spark_write_parquet

### Write a Spark DataFrame to a Parquet file

**Description**

Serialize a Spark DataFrame to the Parquet format.

**Usage**

```r
spark_write_parquet(
  x,
  path,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...)
```

**Arguments**

- **x**: A Spark DataFrame or dplyr operation
- **path**: The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **mode**: A character element. Specifies the behavior when data or table already exists. Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that 'overwrite' will also change the column structure.
  
  For more details see also [https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes](https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes) for your version of Spark.
- **options**: A list of strings with additional options. See [https://spark.apache.org/docs/latest/sql-programming-guide.html#configuration](https://spark.apache.org/docs/latest/sql-programming-guide.html#configuration).
- **partition_by**: A character vector. Partitions the output by the given columns on the file system.
- **...**: Optional arguments; currently unused.
spark_write_rds

Write Spark DataFrame to RDS files

Description

Write Spark dataframe to RDS files. Each partition of the dataframe will be exported to a separate RDS file so that all partitions can be processed in parallel.

Usage

spark_write_rds(x, dest_uri)

Arguments

x A Spark DataFrame to be exported

dest_uri Can be a URI template containing "partitionId" (e.g., "hdfs://my_data_part_{partitionId}.rds") where "partitionId" will be substituted with ID of each partition using `glue`, or a list of URIs to be assigned to RDS output from all partitions (e.g., "hdfs://my_data_part_0.rds", "hdfs://my_data_part_1.rds", and so on) If working with a Spark instance running locally, then all URIs should be in "file://<local file path>" form. Otherwise the scheme of the URI should reflect the underlying file system the Spark instance is working with (e.g., "hdfs://"). If the resulting list of URI(s) does not contain unique values, then it will be post-processed with `make.unique()` to ensure uniqueness.

Value

A tibble containing partition ID and RDS file location for each partition of the input Spark dataframe.

See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_json()`, `spark_write_orc()`, `spark_write_source()`, `spark_write_table()`, `spark_write_text()`
**spark_write_source**  
*W*rites a Spark DataFrame into a *generic source*

**Description**

W*rites a Spark DataFrame into a generic source.*

**Usage**

```r
spark_write_source(
  x,
  source,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...
)
```

**Arguments**

- **x**  
  A Spark DataFrame or dplyr operation

- **source**  
  A data source capable of reading data.

- **mode**  
  A character element. Specifies the behavior when data or table already exists. Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that 'overwrite' will also change the column structure. For more details see also [https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes](https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes) for your version of Spark.

- **options**  
  A list of strings with additional options.

- **partition_by**  
  A character vector. Partitions the output by the given columns on the file system.

- **...**  
  Optional arguments; currently unused.

**See Also**

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_binary()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_json()`, `spark_write_orc()`, `spark_write_parquet()`, `spark_write_table()`, `spark_write_text()`
spark_write_table

Writes a Spark DataFrame into a Spark table

Description

Writes a Spark DataFrame into a Spark table.

Usage

```
spark_write_table(
  x,
  name,
  mode = NULL,
  options = list(),
  partition_by = NULL,
  ...
)
```

Arguments

- `x` A Spark DataFrame or dplyr operation
- `name` The name to assign to the newly generated table.
- `mode` A character element. Specifies the behavior when data or table already exists. Supported values include: ‘error’, ‘append’, ‘overwrite’ and ignore. Notice that ‘overwrite’ will also change the column structure. For more details see also https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes for your version of Spark.
- `options` A list of strings with additional options.
- `partition_by` A character vector. Partitions the output by the given columns on the file system.
- `...` Optional arguments; currently unused.

See Also

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_json()`, `spark_write_orc()`, `spark_write_parquet()`, `spark_write_source()`, `spark_write_text()`
**spark_write_text**  
*Write a Spark DataFrame to a Text file*

**Description**

Serialize a Spark DataFrame to the plain text format.

**Usage**

```r
spark_write_text(  
  x,  
  path,  
  mode = NULL,  
  options = list(),  
  partition_by = NULL,  
  ...  
)
```

**Arguments**

- **x**  
  A Spark DataFrame or dplyr operation

- **path**  
  The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.

- **mode**  
  A character element. Specifies the behavior when data or table already exists. Supported values include: 'error', 'append', 'overwrite' and ignore. Notice that 'overwrite' will also change the column structure. For more details see also [https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes](https://spark.apache.org/docs/latest/sql-programming-guide.html#save-modes) for your version of Spark.

- **options**  
  A list of strings with additional options.

- **partition_by**  
  A character vector. Partitions the output by the given columns on the file system.

- **...**  
  Optional arguments; currently unused.

**See Also**

Other Spark serialization routines: `collect_from_rds()`, `spark_insert_table()`, `spark_load_table()`, `spark_read_avro()`, `spark_read_binary()`, `spark_read_csv()`, `spark_read_delta()`, `spark_read_image()`, `spark_read_jdbc()`, `spark_read_json()`, `spark_read_libsvm()`, `spark_read_orc()`, `spark_read_parquet()`, `spark_read_source()`, `spark_read_table()`, `spark_read_text()`, `spark_read()`, `spark_save_table()`, `spark_write_avro()`, `spark_write_csv()`, `spark_write_delta()`, `spark_write_jdbc()`, `spark_write_json()`, `spark_write_orc()`, `spark_write_parquet()`, `spark_write_source()`, `spark_write_table()`
src_databases

Show database list

Description
Show database list

Usage
src_databases(sc, ...)

Arguments
sc A spark_connection.
... Optional arguments; currently unused.

stream_find
Find Stream

Description
Finds and returns a stream based on the stream’s identifier.

Usage
stream_find(sc, id)

Arguments
sc The associated Spark connection.
id The stream identifier to find.

Examples
## Not run:
sc <- spark_connect(master = "local")
sdf_len(sc, 10) %>%
  spark_write_parquet(path = "parquet-in")

stream <- stream_read_parquet(sc, "parquet-in") %>%
  stream_write_parquet("parquet-out")

stream_id <- stream_id(stream)
stream_find(sc, stream_id)

## End(Not run)
stream_generate_test  Generate Test Stream

Description
Generates a local test stream, useful when testing streams locally.

Usage
stream_generate_test(df = rep(1:1000),
    path = "source",
    distribution = floor(10 + 1e+05 * stats::dbinom(1:20, 20, 0.5)),
    iterations = 50,
    interval = 1)

Arguments
- df: The data frame used as a source of rows to the stream, will be cast to data frame if needed. Defaults to a sequence of one thousand entries.
- path: Path to save stream of files to, defaults to "source".
- distribution: The distribution of rows to use over each iteration, defaults to a binomial distribution. The stream will cycle through the distribution if needed.
- iterations: Number of iterations to execute before stopping, defaults to fifty.
- interval: The interval in seconds used to write the stream, defaults to one second.

Details
This function requires the callr package to be installed.

stream_id  Spark Stream's Identifier

Description
Retrieves the identifier of the Spark stream.

Usage
stream_id(stream)

Arguments
- stream: The spark stream object.
stream_lag

Apply lag function to columns of a Spark Streaming DataFrame

Description

Given a streaming Spark dataframe as input, this function will return another streaming dataframe that contains all columns in the input and column(s) that are shifted behind by the offset(s) specified in ‘...’ (see example)

Usage

stream_lag(x, cols, thresholds = NULL)

Arguments

x An object coercable to a Spark Streaming DataFrame.

cols A list of expressions for a single or multiple variables to create that will contain the value of a previous entry.

thresholds Optional named list of timestamp column(s) and corresponding time duration(s) for determining whether a previous record is sufficiently recent relative to the current record. If the any of the time difference(s) between the current and a previous record is greater than the maximal duration allowed, then the previous record is discarded and will not be part of the query result. The durations can be specified with numeric types (which will be interpreted as max difference allowed in number of milliseconds between 2 UNIX timestamps) or time duration strings such as "5s", "5sec", "5min", "5hour", etc. Any timestamp column in ‘x’ that is not of timestamp of date Spark SQL types will be interpreted as number of milliseconds since the UNIX epoch.

Examples

## Not run:

library(sparklyr)

sc <- spark_connect(master = "local", version = "2.2.0")

streaming_path <- tempfile("days_df_.")
days_df <- tibble::tibble(
  today = weekdays(as.Date(seq(7), origin = "1970-01-01"))
)

num_iters <- 7
stream_generate_test(
  df = days_df,
  path = streaming_path,
  distribution = rep(nrow(days_df), num_iters),
  iterations = num_iters
)
stream_read_csv(sc, streaming_path) %>%
  stream_lag(cols = c(yesterday = today ~ 1, two_days_ago = today ~ 2)) %>%
  collect() %>%
  print(n = 10L)

## End(Not run)

<table>
<thead>
<tr>
<th>stream_name</th>
<th>Spark Stream's Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

Retrieves the name of the Spark stream if available.

**Usage**

`stream_name(stream)`

**Arguments**

- **stream**
  - The spark stream object.

---

**stream_read_csv Read CSV Stream**

**Description**

Reads a CSV stream as a Spark dataframe stream.

**Usage**

```r
stream_read_csv(
  sc, path, name = NULL, header = TRUE, columns = NULL, delimiter = "", quote = "\"", escape = "\\", charset = "UTF-8", null_value = NULL, options = list(), ...
)
```
stream_read_csv

Arguments

- **sc** A spark_connection.
- **path** The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **name** The name to assign to the newly generated stream.
- **header** Boolean; should the first row of data be used as a header? Defaults to TRUE.
- **columns** A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
- **delimiter** The character used to delimit each column. Defaults to '\', '.
- **quote** The character used as a quote. Defaults to '""'.
- **escape** The character used to escape other characters. Defaults to '\\'.
- **charset** The character set. Defaults to "UTF-8".
- **null_value** The character to use for null, or missing, values. Defaults to NULL.
- **options** A list of strings with additional options.
- **...** Optional arguments; currently unused.

See Also

Other Spark stream serialization: stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet(), stream_write_text()

Examples

```r
## Not run:
sc <- spark_connect(master = "local")
dir.create("csv-in")
write.csv(iris, "csv-in/data.csv", row.names = FALSE)

csv_path <- file.path("file://", getwd(), "csv-in")
stream <- stream_read_csv(sc, csv_path) %>% stream_write_csv("csv-out")
stream_stop(stream)
## End(Not run)
```
stream_read_delta  Read Delta Stream

Description

Reads a Delta Lake table as a Spark dataframe stream.

Usage

stream_read_delta(sc, path, name = NULL, options = list(), ...)

Arguments

sc                A spark_connection.
path              The path to the file. Needs to be accessible from the cluster. Supports the
                  "hdfs://", "s3a://" and "file://" protocols.
name              The name to assign to the newly generated stream.
options           A list of strings with additional options.
...               Optional arguments; currently unused.

Details

Please note that Delta Lake requires installing the appropriate package by setting the packages
parameter to "delta" in spark_connect()

See Also

Other Spark stream serialization: stream_read_csv(), stream_read_json(), stream_read_kafka(),
stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(),
stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(),
stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet(),
stream_write_text()

Examples

## Not run:

library(sparklyr)
sd <- spark_connect(master = "local", version = "2.4.0", packages = "delta")
sdf_len(sc, 5) %>% spark_write_delta(path = "delta-test")
stream <- stream_read_delta(sc, "delta-test") %>%
  stream_write_json("json-out")
stream_stop(stream)
## End(Not run)
**stream_read_json**  

Read JSON Stream

**Description**

Reads a JSON stream as a Spark dataframe stream.

**Usage**

```r
stream_read_json(sc, path, name = NULL, columns = NULL, options = list(), ...)
```

**Arguments**

- `sc`  
  A `spark_connection`.
- `path`  
  The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- `name`  
  The name to assign to the newly generated stream.
- `columns`  
  A vector of column names or a named vector of column types. If specified, the elements can be "binary" for `BinaryType`, "boolean" for `BooleanType`, "byte" for `ByteType`, "integer" for `IntegerType`, "integer64" for `LongType`, "double" for `DoubleType`, "character" for `StringType`, "timestamp" for `TimestampType` and "date" for `DateType`.
- `options`  
  A list of strings with additional options.
- `...`  
  Optional arguments; currently unused.

**See Also**

Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_kafka()`, `stream_read_orc()`, `stream_read_parquet()`, `stream_read_socket()`, `stream_read_text()`, `stream_write_console()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_kafka()`, `stream_write_memory()`, `stream_write_orc()`, `stream_write_parquet()`, `stream_write_text()`

**Examples**

```r
## Not run:
sc <- spark_connect(master = "local")
dir.create("json-in")
jsonlite::write_json(list(a = c(1, 2), b = c(10, 20)), "json-in/data.json")
json_path <- file.path("file://", getwd(), "json-in")
stream <- stream_read_json(sc, json_path) %>% stream_write_json("json-out")
stream_stop(stream)
```
stream_read_kafka  Read Kafka Stream

Description
Reads a Kafka stream as a Spark dataframe stream.

Usage
stream_read_kafka(sc, name = NULL, options = list(), ...)

Arguments
- sc: A spark_connection.
- name: The name to assign to the newly generated stream.
- options: A list of strings with additional options.
- ...: Optional arguments; currently unused.

Details
Please note that Kafka requires installing the appropriate package by setting the packages parameter to "kafka" in spark_connect().

See Also
Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet(), stream_write_text()

Examples
## Not run:
library(sparklyr)
scc <- spark_connect(master = "local", version = "2.3", packages = "kafka")
read_options <- list(kafka.bootstrap.servers = "localhost:9092", subscribe = "topic1")
write_options <- list(kafka.bootstrap.servers = "localhost:9092", topic = "topic2")
stream <- stream_read_kafka(sc, options = read_options)  
stream_write_kafka(options = write_options)
stream_read_orc

stream_stop(stream)
## End(Not run)

---

**stream_read_orc**

Read ORC Stream

### Description

Reads an ORC stream as a Spark dataframe stream.

### Usage

```r
stream_read_orc(sc, path, name = NULL, columns = NULL, options = list(), ...)
```

### Arguments

- **sc**
  - A `spark_connection`.
- **path**
  - The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **name**
  - The name to assign to the newly generated stream.
- **columns**
  - A vector of column names or a named vector of column types. If specified, the elements can be "binary" for `BinaryType`, "boolean" for `BooleanType`, "byte" for `ByteType`, "integer" for `IntegerType`, "integer64" for `LongType`, "double" for `DoubleType`, "character" for `StringType`, "timestamp" for `TimestampType` and "date" for `DateType`.
- **options**
  - A list of strings with additional options.
- **...**
  - Optional arguments; currently unused.

### See Also

Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_json()`, `stream_read_kafka()`, `stream_read_parquet()`, `stream_read_socket()`, `stream_read_text()`, `stream_write_console()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_kafka()`, `stream_write_memory()`, `stream_write_orc()`, `stream_write_parquet()`, `stream_write_text()`

### Examples

```r
## Not run:
sd <- spark_connect(master = "local")
sdf_len(sd, 10) %>% spark_write_orc("orc-in")
stream <- stream_read_orc(sc, "orc-in") %>% stream_write_orc("orc-out")
```
stream_read_parquet

##Description
Reads a parquet stream as a Spark dataframe stream.

##Usage

```r
stream_read_parquet(
  sc,
  path,
  name = NULL,
  columns = NULL,
  options = list(),
  ...
)
```

###Arguments

- **sc**: A spark_connection.
- **path**: The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **name**: The name to assign to the newly generated stream.
- **columns**: A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
- **options**: A list of strings with additional options.
- **...**: Optional arguments; currently unused.

###See Also
Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_json()`, `stream_read_kafka()`, `stream_read_orc()`, `stream_read_socket()`, `stream_read_text()`, `stream_write_console()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_kafka()`, `stream_write_memory()`, `stream_write_orc()`, `stream_write_parquet()`, `stream_write_text()`
stream_read_socket

Examples

## Not run:

```r
c <- spark_connect(master = "local")
sdf_len(c, 10) %>% spark_write_parquet("parquet-in")
stream <- stream_read_parquet(c, "parquet-in") %>% stream_write_parquet("parquet-out")
stream_stop(stream)
## End(Not run)
```

---

stream_read_socket  Read Socket Stream

Description

Reads a Socket stream as a Spark dataframe stream.

Usage

```r
stream_read_socket(c, name = NULL, columns = NULL, options = list(), ...)
```

Arguments

- `sc`: A spark_connection.
- `name`: The name to assign to the newly generated stream.
- `columns`: A vector of column names or a named vector of column types. If specified, the elements can be "binary" for BinaryType, "boolean" for BooleanType, "byte" for ByteType, "integer" for IntegerType, "integer64" for LongType, "double" for DoubleType, "character" for StringType, "timestamp" for TimestampType and "date" for DateType.
- `options`: A list of strings with additional options.
- `...`: Optional arguments; currently unused.

See Also

Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_json()`, `stream_read_kafka()`, `stream_read_orc()`, `stream_read_parquet()`, `stream_read_text()`, `stream_write_console()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_kafka()`, `stream_write_memory()`, `stream_write_orc()`, `stream_write_parquet()`, `stream_write_text()`
stream_read_text

Read Text Stream

Description

Reads a text stream as a Spark dataframe stream.

Usage

stream_read_text(sc, path, name = NULL, options = list(), ...)

Arguments

- **sc**: A spark_connection.
- **path**: The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **name**: The name to assign to the newly generated stream.
- **options**: A list of strings with additional options.
- **...**: Optional arguments; currently unused.

See Also

Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet(), stream_write_text()

Examples

```r
## Not run:
sc <- spark_connect(master = "local")

# Start socket server from terminal, example: nc -lk 9999
stream <- stream_read_socket(sc, options = list(host = "localhost", port = 9999))
stream

## End(Not run)

dir.create("text-in")
```
writeLines("A text entry", "text-in/text.txt")

text_path <- file.path("file://", getwd(), "text-in")

stream <- stream_read_text(sc, text_path) %>% stream_write_text("text-out")

stream_stop(stream)

## End(Not run)

---

**stream_render**

*Render Stream*

**Description**

Collects streaming statistics to render the stream as an 'htmlwidget'.

**Usage**

```
stream_render(stream = NULL, collect = 10, stats = NULL, ...)
```

**Arguments**

- `stream`: The stream to render
- `collect`: The interval in seconds to collect data before rendering the 'htmlwidget'.
- `stats`: Optional stream statistics collected using `stream_stats()`, when specified, `stream` should be omitted.
- `...`: Additional optional arguments.

**Examples**

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local")

dir.create("iris-in")
write.csv(iris, "iris-in/iris.csv", row.names = FALSE)

stream <- stream_read_csv(sc, "iris-in/") %>%
  stream_write_csv("iris-out/")

stream_render(stream)
stream_stop(stream)

## End(Not run)
```
stream_stats  Stream Statistics

Description
Collects streaming statistics, usually, to be used with stream_render() to render streaming statistics.

Usage
stream_stats(stream, stats = list())

Arguments
- stream: The stream to collect statistics from.
- stats: An optional stats object generated using stream_stats().

Value
A stats object containing streaming statistics that can be passed back to the stats parameter to continue aggregating streaming stats.

Examples
## Not run:
sc <- spark_connect(master = "local")
sdf_len(sc, 10) %>%
  spark_write_parquet(path = "parquet-in")

stream <- stream_read_parquet(sc, "parquet-in") %>%
  stream_write_parquet("parquet-out")

stream_stats(stream)
## End(Not run)

stream_stop  Stops a Spark Stream

Description
Stops processing data from a Spark stream.

Usage
stream_stop(stream)
stream_trigger_continuous

**Arguments**

- **stream**
  The spark stream object to be stopped.

---

**stream_trigger_continuous**

*Spark Stream Continuous Trigger*

---

**Description**

Creates a Spark structured streaming trigger to execute continuously. This mode is the most performant but not all operations are supported.

**Usage**

```
stream_trigger_continuous(checkpoint = 5000)
```

**Arguments**

- **checkpoint**
  The checkpoint interval specified in milliseconds.

**See Also**

- `stream_trigger_interval`

---

**stream_trigger_interval**

*Spark Stream Interval Trigger*

---

**Description**

Creates a Spark structured streaming trigger to execute over the specified interval.

**Usage**

```
stream_trigger_interval(interval = 1000)
```

**Arguments**

- **interval**
  The execution interval specified in milliseconds.

**See Also**

- `stream_trigger_continuous`
### stream_view

**View Stream**

**Description**

Opens a Shiny gadget to visualize the given stream.

**Usage**

```r
stream_view(stream, ...)
```

**Arguments**

- `stream`: The stream to visualize.
- `...`: Additional optional arguments.

**Examples**

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local")

dir.create("iris-in")
write.csv(iris, "iris-in/iris.csv", row.names = FALSE)

stream_read_csv(sc, "iris-in") %>%
  stream_write_csv("iris-out") %>%
  stream_view() %>%
  stream_stop()

## End(Not run)
```

### stream_watermark

**Watermark Stream**

**Description**

Ensures a stream has a watermark defined, which is required for some operations over streams.

**Usage**

```r
stream_watermark(x, column = "timestamp", threshold = "10 minutes")
```
stream_write_console

Arguments

- **x**: An object coercable to a Spark Streaming DataFrame.
- **column**: The name of the column that contains the event time of the row, if the column is missing, a column with the current time will be added.
- **threshold**: The minimum delay to wait to data to arrive late, defaults to ten minutes.

Description

Writes a Spark dataframe stream into console logs.

Usage

```r
stream_write_console(
  x,
  mode = c("append", "complete", "update"),
  options = list(),
  trigger = stream_trigger_interval(),
  partition_by = NULL,
  ...
)
```

Arguments

- **x**: A Spark DataFrame or dplyr operation
- **mode**: Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".
- **options**: A list of strings with additional options.
- **trigger**: The trigger for the stream query, defaults to micro-batches running every 5 seconds. See `stream_trigger_interval` and `stream_trigger_continuous`.
- **partition_by**: Partitions the output by the given list of columns.
- **...**: Optional arguments; currently unused.

See Also

Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_json()`, `stream_read_kafka()`, `stream_read_orc()`, `stream_read_parquet()`, `stream_read_socket()`, `stream_read_text()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_kafka()`, `stream_write_memory()`, `stream_write_orc()`, `stream_write_parquet()`, `stream_write_text()`
Examples

```r
## Not run:

sc <- spark_connect(master = "local")

sdf_len(sc, 10) %>%
  dplyr::transmute(text = as.character(id)) %>%
  spark_write_text("text-in")

stream <- stream_read_text(sc, "text-in") %>% stream_write_console()

stream_stop(stream)

## End(Not run)
```

---

**stream_write_csv**

**Write CSV Stream**

**Description**

Writes a Spark dataframe stream into a tabular (typically, comma-separated) stream.

**Usage**

```r
stream_write_csv(
  x,
  path,
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path(path, "checkpoint"),
  header = TRUE,
  delimiter = ",",
  quote = "\"",
  escape = "\\",
  charset = "UTF-8",
  null_value = NULL,
  options = list(),
  partition_by = NULL,
  ...
)
```

**Arguments**

- **x**: A Spark DataFrame or dplyr operation
- **path**: The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
stream_write_csv

mode Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".

trigger The trigger for the stream query, defaults to micro-batches running every 5 seconds. See stream_trigger_interval and stream_trigger_continuous.

checkpoint The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.

header Should the first row of data be used as a header? Defaults to TRUE.

delimiter The character used to delimit each column, defaults to \.

quote The character used as a quote. Defaults to "."

escape The character used to escape other characters, defaults to \.

charset The character set, defaults to "UTF-8".

null_value The character to use for default values, defaults to NULL.

options A list of strings with additional options.

partition_by Partitions the output by the given list of columns.

... Optional arguments; currently unused.

See Also

Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet(), stream_write_text()

Examples

## Not run:

sc <- spark_connect(master = "local")
dir.create("csv-in")
write.csv(iris, "csv-in/data.csv", row.names = FALSE)
csv_path <- file.path("file://", getwd(), "csv-in")

stream <- stream_read_csv(sc, csv_path) %>% stream_write_csv("csv-out")
stream_stop(stream)

## End(Not run)
stream_write_delta  Write Delta Stream

Description
Writes a Spark dataframe stream into a Delta Lake table.

Usage
stream_write_delta(
  x,
  path,
  mode = c("append", "complete", "update"),
  checkpoint = file.path("checkpoints", random_string("")),
  options = list(),
  partition_by = NULL,
  ...
)

Arguments
x A Spark DataFrame or dplyr operation
path The path to the file. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
mode Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".
checkpoint The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.
options A list of strings with additional options.
partition_by Partitions the output by the given list of columns.
... Optional arguments; currently unused.

Details
Please note that Delta Lake requires installing the appropriate package by setting the packages parameter to "delta" in spark_connect()

See Also
Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_csv(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet(), stream_write_text()
stream_write_json

## Examples

```r
## Not run:

library(sparklyr)
sc <- spark_connect(master = "local", version = "2.4.0", packages = "delta")

dir.create("text-in")
writeLines("A text entry", "text-in/text.txt")

text_path <- file.path\("file://", getwd(), \"text-in\")

stream <- stream_read_text(sc, text_path) %>% stream_write_delta(path = "delta-test")
stream_stop(stream)

## End(Not run)
```

---

**stream_write_json**     Write JSON Stream

### Description

Writes a Spark dataframe stream into a JSON stream.

### Usage

```r
stream_write_json(
  x,
  path,
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path(path, \"checkpoints\", random_string\("\"\")),
  options = list(),
  partition_by = NULL,
  ...
)
```

### Arguments

- **x**: A Spark DataFrame or dplyr operation
- **path**: The destination path. Needs to be accessible from the cluster. Supports the \"hdfs://\", \"s3a://\" and \"file://\" protocols.
- **mode**: Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".
- **trigger**: The trigger for the stream query, defaults to micro-batches running every 5 seconds. See `stream_trigger_interval` and `stream_trigger_continuous`.
stream_write_kafka

**Description**

Writes a Spark dataframe stream into a Kafka stream.

**Usage**

```r
stream_write_kafka(
  x,
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path("checkpoints", random_string("")),
  options = list(),
  partition_by = NULL,
  ...
)
```
stream_write_kafka

Arguments

- **x**: A Spark DataFrame or dplyr operation
- **mode**: Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".
- **trigger**: The trigger for the stream query, defaults to micro-batches running every 5 seconds. See `stream_trigger_interval` and `stream_trigger_continuous`.
- **checkpoint**: The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.
- **options**: A list of strings with additional options.
- **partition_by**: Partitions the output by the given list of columns.
- **...**: Optional arguments; currently unused.

Details

Please note that Kafka requires installing the appropriate package by setting the `packages` parameter to "kafka" in `spark_connect()`

See Also

Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_json()`, `stream_read_kafka()`, `stream_read_orc()`, `stream_read_parquet()`, `stream_read_socket()`, `stream_read_text()`, `stream_write_console()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_memory()`, `stream_write_orc()`, `stream_write_parquet()`, `stream_write_text()`

Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "local", version = "2.3", packages = "kafka")

read_options <- list(kafka.bootstrap.servers = "localhost:9092", subscribe = "topic1")
write_options <- list(kafka.bootstrap.servers = "localhost:9092", topic = "topic2")

stream <- stream_read_kafka(sc, options = read_options) %>%
  stream_write_kafka(options = write_options)

stream_stop(stream)

## End(Not run)
```
stream_write_memory  Write Memory Stream

Description

Writes a Spark dataframe stream into a memory stream.

Usage

stream_write_memory(
  x,
  name = random_string("sparklyr_tmp_"),
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path("checkpoints", name, random_string("")),
  options = list(),
  partition_by = NULL,
  ...
)

Arguments

x  A Spark DataFrame or dplyr operation
name  The name to assign to the newly generated stream.
mode  Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".
trigger  The trigger for the stream query, defaults to micro-batches running every 5 seconds. See stream_trigger_interval and stream_trigger_continuous.
checkpoint  The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.
options  A list of strings with additional options.
partition_by  Partitions the output by the given list of columns.
...  Optional arguments; currently unused.

See Also

Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_orc(), stream_write_parquet(), stream_write_text()
stream_write_orc

Examples

```r
## Not run:

sc <- spark_connect(master = "local")

dir.create("csv-in")
write.csv(iris, "csv-in/data.csv", row.names = FALSE)

csv_path <- file.path("file://", getwd(), "csv-in")

stream <- stream_read_csv(sc, csv_path) %>% stream_write_memory("csv-out")

stream_stop(stream)

## End(Not run)
```

---

stream_write_orc   Write a ORC Stream

Description

Writes a Spark dataframe stream into an ORC stream.

Usage

```r
stream_write_orc(
  x,
  path,
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path(path, "checkpoints", random_string("")),
  options = list(),
  partition_by = NULL,
  ...
)
```

Arguments

- **x**: A Spark DataFrame or dplyr operation
- **path**: The destination path. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.
- **mode**: Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".
- **trigger**: The trigger for the stream query, defaults to micro-batches running every 5 seconds. See `stream_trigger_interval` and `stream_trigger_continuous`. 
checkpoint  
The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.

options  
A list of strings with additional options.

partition_by  
Partitions the output by the given list of columns.

...  
Optional arguments; currently unused.

See Also

Other Spark stream serialization: `stream_read_csv()`, `stream_read_delta()`, `stream_read_json()`, `stream_read_kafka()`, `stream_read_orc()`, `stream_read_parquet()`, `stream_read_socket()`, `stream_read_text()`, `stream_write_console()`, `stream_write_csv()`, `stream_write_delta()`, `stream_write_json()`, `stream_write_kafka()`, `stream_write_memory()`, `stream_write_parquet()`, `stream_write_text()`

Examples

```r
## Not run:
sc <- spark_connect(master = "local")
sdf_len(sc, 10) %>% spark_write_orc("orc-in")
stream <- stream_read_orc(sc, "orc-in") %>% stream_write_orc("orc-out")
stream_stop(stream)
## End(Not run)
```

---

**stream_write_parquet**  
*Write Parquet Stream*

Description

Writes a Spark dataframe stream into a parquet stream.

Usage

```r
stream_write_parquet(
x,
  path = c("append", "complete", "update"),
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path(path, "checkpoints", random_string("")),
  options = list(),
  partition_by = NULL,
  ...
)
```

stream_write_text

Arguments

<table>
<thead>
<tr>
<th>x</th>
<th>A Spark DataFrame or dplyr operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>The destination path. Needs to be accessible from the cluster. Supports the &quot;hdfs://&quot;, &quot;s3a://&quot; and &quot;file://&quot; protocols.</td>
</tr>
<tr>
<td>mode</td>
<td>Specifies how data is written to a streaming sink. Valid values are &quot;append&quot;, &quot;complete&quot; or &quot;update&quot;.</td>
</tr>
<tr>
<td>trigger</td>
<td>The trigger for the stream query, defaults to micro-batches running every 5 seconds. See stream_trigger_interval and stream_trigger_continuous.</td>
</tr>
<tr>
<td>checkpoint</td>
<td>The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.</td>
</tr>
<tr>
<td>options</td>
<td>A list of strings with additional options.</td>
</tr>
<tr>
<td>partition_by</td>
<td>Partitions the output by the given list of columns.</td>
</tr>
<tr>
<td>...</td>
<td>Optional arguments; currently unused.</td>
</tr>
</tbody>
</table>

See Also

Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_text()

Examples

```r
## Not run:
sc <- spark_connect(master = "local")
sdf_len(sc, 10) %>% spark_write_parquet("parquet-in")
stream <- stream_read_parquet(sc, "parquet-in") %>% stream_write_parquet("parquet-out")
stream_stop(stream)
## End(Not run)
```

stream_write_text  Write Text Stream

Description

Writes a Spark dataframe stream into a text stream.
stream_write_text

Usage

stream_write_text(
  x,
  path,
  mode = c("append", "complete", "update"),
  trigger = stream_trigger_interval(),
  checkpoint = file.path(path, "checkpoints", random_string("")),
  options = list(),
  partition_by = NULL,
  ...
)

Arguments

x A Spark DataFrame or dplyr operation

path The destination path. Needs to be accessible from the cluster. Supports the "hdfs://", "s3a://" and "file://" protocols.

mode Specifies how data is written to a streaming sink. Valid values are "append", "complete" or "update".

trigger The trigger for the stream query, defaults to micro-batches running every 5 seconds. See stream_trigger_interval and stream_trigger_continuous.

checkpoint The location where the system will write all the checkpoint information to guarantee end-to-end fault-tolerance.

options A list of strings with additional options.

partition_by Partitions the output by the given list of columns.

... Optional arguments; currently unused.

See Also

Other Spark stream serialization: stream_read_csv(), stream_read_delta(), stream_read_json(), stream_read_kafka(), stream_read_orc(), stream_read_parquet(), stream_read_socket(), stream_read_text(), stream_write_console(), stream_write_csv(), stream_write_delta(), stream_write_json(), stream_write_kafka(), stream_write_memory(), stream_write_orc(), stream_write_parquet()
### tbl_cache

_Cache a Spark Table_

**Description**

Force a Spark table with name `name` to be loaded into memory. Operations on cached tables should normally (although not always) be more performant than the same operation performed on an uncached table.

**Usage**

```r
tbl_cache(sc, name, force = TRUE)
```

**Arguments**

- `sc`         A `spark_connection`.
- `name`       The table name.
- `force`      Force the data to be loaded into memory? This is accomplished by calling the `count` API on the associated Spark DataFrame.

### tbl_change_db

_Use specific database_

**Description**

Use specific database

**Usage**

```r
tbl_change_db(sc, name)
```

**Arguments**

- `sc`         A `spark_connection`.
- `name`       The database name.
### tbl_uncache

**Uncache a Spark Table**

**Description**

Force a Spark table with name `name` to be unloaded from memory.

**Usage**

```
tbl_uncache(sc, name)
```

**Arguments**

- `sc` A `spark_connection`
- `name` The table name.

### transform_sdf

**transform a subset of column(s) in a Spark Dataframe**

**Description**

transform a subset of column(s) in a Spark Dataframe

**Usage**

```
transform_sdf(x, cols, fn)
```

**Arguments**

- `x` An object coercible to a Spark DataFrame
- `cols` Subset of columns to apply transformation to
- `fn` Transformation function taking column name as the 1st parameter, the corresponding `org.apache.spark.sql.Column` object as the 2nd parameter, and returning a transformed `org.apache.spark.sql.Column` object

### unite

**Unite**

**Description**

See `unite` for more details.
Unnest

Description

See `unnest` for more details.

subtitle

Subsetting operator for Spark dataframe

Description

Subsetting operator for Spark dataframe allowing a subset of column(s) to be selected using syntaxes similar to those supported by R dataframes.

Usage

```r
## S3 method for class 'tbl_spark'
x[i]
```

Arguments

- `x`: The Spark dataframe
- `i`: Expression specifying subset of column(s) to include or exclude from the result (e.g., `"col1"`, `c("col1", "col2")`, `[1:10]`, `[1:10]`, `[NULL]`, or `[1]`)

Examples

```r
## Not run:
library(sparklyr)
sc <- spark_connect(master = "spark://HOST:PORT")
example_sdf <- copy_to(sc, tibble::tibble(a = 1, b = 2))
example_sdf["a"] %>% print()

## End(Not run)
```
Infix operator for composing a lambda expression

Description
Infix operator that allows a lambda expression to be composed in R and be translated to Spark SQL equivalent using `dbplyr::translate_sql` functionalities.

Usage
params %->% ...

Arguments
params Parameter(s) of the lambda expression, can be either a single parameter or a comma separated list of parameters in the form of .(param1, param2, ... ) (see examples)
...
Body of the lambda expression, *must be within parentheses*

Details
Notice when composing a lambda expression in R, the body of the lambda expression *must always be surrounded with parentheses*, otherwise a parsing error will occur.

Examples
## Not run:
a %->% (mean(a) + 1) # translates to <SQL> `a` -> (AVG(`a`) OVER () + 1.0)
.(a, b) %->% (a < 1 && b > 1) # translates to <SQL> `a`, `b` -> (`a` < 1.0 AND `b` > 1.0)
## End(Not run)
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