Package ‘dials’

June 10, 2020

Version 0.0.7

Title Tools for Creating Tuning Parameter Values

Description Many models contain tuning parameters (i.e. parameters that cannot be directly estimated from the data). These tools can be used to define objects for creating, simulating, or validating values for such parameters.

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URL https://tidymodels.github.io/dials,
https://github.com/tidymodels/dials

BugReports https://github.com/tidymodels/dials/issues

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### R topics documented:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>activation</td>
<td>3</td>
</tr>
<tr>
<td>Chicago</td>
<td>3</td>
</tr>
<tr>
<td>cost</td>
<td>4</td>
</tr>
<tr>
<td>degree</td>
<td>5</td>
</tr>
<tr>
<td>deg_free</td>
<td>6</td>
</tr>
<tr>
<td>dist_power</td>
<td>6</td>
</tr>
<tr>
<td>dropout</td>
<td>7</td>
</tr>
<tr>
<td>finalize</td>
<td>8</td>
</tr>
<tr>
<td>freq_cut</td>
<td>10</td>
</tr>
<tr>
<td>grid_max_entropy</td>
<td>11</td>
</tr>
<tr>
<td>grid_regular</td>
<td>14</td>
</tr>
<tr>
<td>Laplace</td>
<td>16</td>
</tr>
<tr>
<td>learn_rate</td>
<td>17</td>
</tr>
<tr>
<td>max_times</td>
<td>17</td>
</tr>
<tr>
<td>max_tokens</td>
<td>18</td>
</tr>
<tr>
<td>min_dist</td>
<td>19</td>
</tr>
<tr>
<td>min_unique</td>
<td>19</td>
</tr>
<tr>
<td>mixture</td>
<td>20</td>
</tr>
<tr>
<td>mtry</td>
<td>20</td>
</tr>
<tr>
<td>neighbors</td>
<td>21</td>
</tr>
<tr>
<td>new-param</td>
<td>22</td>
</tr>
<tr>
<td>num_breaks</td>
<td>23</td>
</tr>
<tr>
<td>num_comp</td>
<td>24</td>
</tr>
<tr>
<td>num_hash</td>
<td>25</td>
</tr>
<tr>
<td>num_tokens</td>
<td>25</td>
</tr>
<tr>
<td>over_ratio</td>
<td>26</td>
</tr>
<tr>
<td>parameters</td>
<td>27</td>
</tr>
<tr>
<td>penalty</td>
<td>27</td>
</tr>
<tr>
<td>predictor_prop</td>
<td>28</td>
</tr>
<tr>
<td>prune_method</td>
<td>29</td>
</tr>
<tr>
<td>range_validate</td>
<td>29</td>
</tr>
<tr>
<td>rbf_sigma</td>
<td>30</td>
</tr>
<tr>
<td>smoothness</td>
<td>31</td>
</tr>
<tr>
<td>surv_dist</td>
<td>32</td>
</tr>
<tr>
<td>threshold</td>
<td>32</td>
</tr>
<tr>
<td>token</td>
<td>33</td>
</tr>
<tr>
<td>trees</td>
<td>34</td>
</tr>
<tr>
<td>unknown</td>
<td>35</td>
</tr>
<tr>
<td>update.parameters</td>
<td>36</td>
</tr>
<tr>
<td>value_validate</td>
<td>37</td>
</tr>
<tr>
<td>weight</td>
<td>38</td>
</tr>
<tr>
<td>weight_func</td>
<td>39</td>
</tr>
<tr>
<td>weight_scheme</td>
<td>40</td>
</tr>
<tr>
<td>window_size</td>
<td>40</td>
</tr>
</tbody>
</table>

**Index**  

42
Activation functions between network layers

Description
Activation functions between network layers

Usage
activation(values = values_activation)

values_activation

Arguments
values A character string of possible values. See values_activation in examples below.

Format
An object of class character of length 4.

Details
This parameter is used in parsnip models for neural networks such as parsnip::mlp().

Examples
values_activation
activation()

Chicago Ridership Data

Description
Chicago Ridership Data

Details
These data are from Kuhn and Johnson (2020) and contain an abbreviated training set for modeling the number of people (in thousands) who enter the Clark and Lake L station.

The date column corresponds to the current date. The columns with station names (Austin through California) are a sample of the columns used in the original analysis (for file size reasons). These are 14 day lag variables (i.e. date - 14 days). There are columns related to weather and sports team schedules.

The station at 35th and Archer is contained in the column Archer_35th to make it a valid R column name.
Value

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>a tibble</td>
</tr>
<tr>
<td>stations</td>
<td>a vector of station names</td>
</tr>
</tbody>
</table>

Source


Examples

data(Chicago)
str(Chicago)
stations

cost
svm_margin

Description

Parameters related to the SVM objective function(s).

Usage

cost(range = c(-10, -1), trans = log2_trans())

svm_margin(range = c(0, 0.2), trans = NULL)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>range</td>
<td>A two-element vector holding the defaults for the smallest and largest possible values, respectively.</td>
</tr>
<tr>
<td>trans</td>
<td>A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.</td>
</tr>
</tbody>
</table>

Examples

cost()
svm_margin()
**Parameters for exponents**

**Description**

These parameters help model cases where an exponent is of interest (e.g. `degree()` or `spline_degree()`) or a product is used (e.g. `prod_degree`).

**Usage**

```r
degree(range = c(1, 3), trans = NULL)

degree_int(range = c(1L, 3L), trans = NULL)

spline_degree(range = c(3L, 10L), trans = NULL)

prod_degree(range = c(1L, 2L), trans = NULL)
```

**Arguments**

- `range` A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- `trans` A `trans` object from the `scales` package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

**Details**

`degree()` is helpful for parameters that are real number exponents (e.g. `x^degree`) whereas `degree_int()` is for cases where the exponent should be an integer.

The difference between `degree_int()` and `spline_degree()` is the default ranges (which is based on the context of how/where they are used).

`prod_degree()` is used by `parsnip::mars()` for the number of terms in interactions (and generates an integer).

**Examples**

```r
degree()
degree_int()
spline_degree()
prod_degree()
```
### deg_free

**Degrees of freedom (integer)**

**Description**

The number of degrees of freedom used for model parameters.

**Usage**

```r
deg_free(range = c(1L, 5L), trans = NULL)
```

**Arguments**

- **range**: A two-element vector holding the defaults for the smallest and largest possible values, respectively.
- **trans**: A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

**Details**

One context in which this parameter is used is spline basis functions.

**Examples**

```r
deg_free()
```

### dist_power

**Minkowski distance parameter**

**Description**

Used in `parsnip::nearest_neighbor()`.

**Usage**

```r
dist_power(range = c(1, 2), trans = NULL)
```

**Arguments**

- **range**: A two-element vector holding the defaults for the smallest and largest possible values, respectively.
- **trans**: A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`. 
Details

This parameter controls how distances are calculated. For example, dist_power = 1 corresponds to Manhattan distance while dist_power = 2 is Euclidean distance.

Examples

dist_power()

<table>
<thead>
<tr>
<th>dropout</th>
<th>Neural network parameters</th>
</tr>
</thead>
</table>

Description

These functions generate parameters that are useful for neural network models.

Usage

dropout(range = c(0, 1), trans = NULL)
epochs(range = c(1L, 1000L), trans = NULL)
hidden_units(range = c(1L, 10L), trans = NULL)
batch_size(range = c(unknown(), unknown()), trans = log2_trans())

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.
trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Details

• dropout(): The parameter dropout rate. (See parsnip::mlp()).
• epochs(): The number of iterations of training. (See parsnip::mlp()).
• hidden_units(): The number of hidden units in a network layer. (See parsnip::mlp()).
• batch_size(): The mini-batch size for neural networks.

Examples

dropout()
finalize

Functions to finalize data-specific parameter ranges

Description

These functions take a parameter object and modify the unknown parts of ranges based on a data set and simple heuristics.

Usage

finalize(object, ...)

## S3 method for class 'list'
finalize(object, x, force = TRUE, ...)

## S3 method for class 'param'
finalize(object, x, force = TRUE, ...)

## S3 method for class 'parameters'
finalize(object, x, force = TRUE, ...)

get_p(object, x, log_vals = FALSE, ...)

get_log_p(object, x, ...)

get_n_frac(object, x, log_vals = FALSE, frac = 1/3, ...)

get_n_frac_range(object, x, log_vals = FALSE, frac = c(1/10, 5/10), ...)

get_n(object, x, log_vals = FALSE, ...)

get_rbf_range(object, x, seed = sample.int(10^5, 1), ...)

get_batch_sizes(object, x, frac = c(1/10, 1/3), ...)

Arguments

object

A param object or a list of param objects.

... Other arguments to pass to the underlying parameter finalizer functions. For example, for get_rbf_range(), the dots are passed along to kernlab::sigest().

x The predictor data. In some cases (see below) this should only include numeric data.

force A single logical that indicates that, even if the parameter object is complete, should it update the ranges anyway?

log_vals A logical: should the ranges be set on the log10 scale?
finalize

frac A double for the fraction of the data to be used for the upper bound. For get_n_frac_range() and get_batch_sizes(), a vector of two fractional values are required.

seed An integer to control the randomness of the calculations.

Details

finalize() runs the embedded finalizer function contained in the param object (object$finalize) and returns the updated version. The finalization function is one of the get_*() helpers. The get_*() helper functions are designed to be used with the pipe and update the parameter object in-place.

get_p() and get_log_p() set the upper value of the range to be the number of columns in the data (on the natural and log10 scale, respectively).

get_n() and get_n_frac() set the upper value to be to be the number of rows in the data, or a fraction of the total number of rows.

get_rbf_range() sets both bounds based on the heuristic defined in kernlab::sigest(). It requires that all columns in x be numeric.

Value

An updated param object or a list of updated param objects depending on what is provided in object.

Examples

library(dplyr)
car_pred <- select(mtcars, -mpg)

# Needs an upper bound
mtry()
finalize(mtry(), car_pred)

# Nothing to do here since no unknowns
penalty()
finalize(penalty(), car_pred)

library(kernlab)
library(tibble)
library(purrr)

params <-
  tribble(
    ~parameter, ~object,
    "mtry", mtry(),
    "num_terms", num_terms(),
    "rbf_sigma", rbf_sigma()
  )
params

# Note that `rbf_sigma()` has a default range that does not need to be
freq_cut

Near-zero variance parameters

Description

These parameters control the specificity of the filter for near-zero variance parameters in recipes::step_nzv().

Usage

freq_cut(range = c(5, 25), trans = NULL)
unique_cut(range = c(0, 100), trans = NULL)

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.
trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Details

Smaller values of freq_cut() and unique_cut() make the filter less sensitive.

Examples

eval(freq_cut())
eval(unique_cut())
**grid_max_entropy**  

*Space-filling parameter grids*

**Description**

Experimental designs for computer experiments are used to construct parameter grids that try to cover the parameter space such that any portion of the space has an observed combination that is not too far from it.

**Usage**

```r
grid_max_entropy(
  x,
  ...,  
  size = 3,  
  original = TRUE,  
  variogram_range = 0.5,  
  iter = 1000
)
```

## S3 method for class 'parameters'

```r
grid_max_entropy(
  x,
  ...,  
  size = 3,  
  original = TRUE,  
  variogram_range = 0.5,  
  iter = 1000
)
```

## S3 method for class 'list'

```r
grid_max_entropy(
  x,
  ...,  
  size = 3,  
  original = TRUE,  
  variogram_range = 0.5,  
  iter = 1000
)
```

## S3 method for class 'param'

```r
grid_max_entropy(
  x,
  ...,  
  size = 3,  
  original = TRUE,  
  variogram_range = 0.5,  
)
## S3 method for class 'workflow'
grid_max_entropy(
x, 
..., 
size = 3, 
original = TRUE, 
variogram_range = 0.5, 
it = 1000 
)

grid_latin_hypercube(x, ..., size = 3, original = TRUE)

## S3 method for class 'parameters'
grid_latin_hypercube(x, ..., size = 3, original = TRUE)

## S3 method for class 'list'
grid_latin_hypercube(x, ..., size = 3, original = TRUE)

## S3 method for class 'param'
grid_latin_hypercube(x, ..., size = 3, original = TRUE)

## S3 method for class 'workflow'
grid_latin_hypercube(x, ..., size = 3, original = TRUE)

### Arguments

- **x**: A param object, list, or parameters.
- **...**: One or more param objects (such as `mtry()` or `penalty()`). None of the objects can have `unknown()` values in the parameter ranges or values.
- **size**: A single integer for the total number of parameter value combinations returned.
- **original**: A logical: should the parameters be in the original units or in the transformed space (if any)?
- **variogram_range**: A numeric value greater than zero. Larger values reduce the likelihood of empty regions in the parameter space.
- **iter**: An integer for the maximum number of iterations used to find a good design.

### Details

The types of designs supported here are latin hypercube designs and designs that attempt to maximize the determinant of the spatial correlation matrix between coordinates. Both designs use random sampling of points in the parameter space.

Note that there may a difference in grids depending on how the function is called. If the call uses the parameter objects directly the possible ranges come from the objects in `dials`. For example:
cost()

## Cost (quantitative)
## Transformer: log-2
## Range (transformed scale): [-10, -1]

set.seed(283)
cost_grid_1 <- grid_latin_hypercube(cost(), size = 1000)
range(log2(cost_grid_1$cost))

## [1] -9.998623 -1.000423

However, in some cases, the tune package overrides the default ranges for specific models. If the grid function uses a parameter's object created from a model or recipe, the ranges may have different defaults (specific to those models). Using the example above, the cost argument above is different for SVM models:

library(parsnip)
library(tune)

# When used in tune, the log2 range is [-10, 5]
svm_mod <-
  svm_rbf(cost = tune()) %>%
  set_engine("kernlab")

set.seed(283)
cost_grid_2 <- grid_latin_hypercube(parameters(svm_mod), size = 1000)
range(log2(cost_grid_2$cost))


References


Examples

grid_max_entropy(
  hidden_units(),
  penalty(),
  epochs(),
  activation(),
)
Description

Random and regular grids can be created for any number of parameter objects.

Usage

grid_regular(x, ..., levels = 3, original = TRUE, filter = NULL)
## S3 method for class 'parameters'
grid_regular(x, ..., levels = 3, original = TRUE, filter = NULL)
## S3 method for class 'list'
grid_regular(x, ..., levels = 3, original = TRUE, filter = NULL)
## S3 method for class 'param'
grid_regular(x, ..., levels = 3, original = TRUE, filter = NULL)
## S3 method for class 'workflow'
grid_regular(x, ..., levels = 3, original = TRUE, filter = NULL)

make_regular_grid(..., levels = 3, original = TRUE, filter = NULL)

grid_random(x, ..., size = 5, original = TRUE, filter = NULL)
## S3 method for class 'parameters'
grid_random(x, ..., size = 5, original = TRUE, filter = NULL)
## S3 method for class 'list'
grid_random(x, ..., size = 5, original = TRUE, filter = NULL)
## S3 method for class 'param'
grid_random(x, ..., size = 5, original = TRUE, filter = NULL)
## S3 method for class 'workflow'
grid_random(x, ..., size = 5, original = TRUE, filter = NULL)
Arguments

- **x**: A param object, list, or parameters.
- **...**: One or more param objects (such as `mtry()` or `penalty()`). None of the objects can have unknown() values in the parameter ranges or values.
- **levels**: An integer for the number of values of each parameter to use to make the regular grid. levels can be a single integer or a vector of integers that is the same length as the number of parameters in ... levels can be a named integer vector, with names that match the id values of parameters.
- **original**: A logical: should the parameters be in the original units or in the transformed space (if any)?
- **filter**: A logical: should the parameters be filtered prior to generating the grid. Must be a single expression referencing parameter names that evaluates to a logical vector.
- **size**: A single integer for the total number of parameter value combinations returned for the random grid.

Details

Note that there may a difference in grids depending on how the function is called. If the call uses the parameter objects directly the possible ranges come from the objects in dials. For example:

```r
mixture()
## Proportion of lasso Penalty (quantitative)
## Range: [0, 1]
set.seed(283)
mix_grid_1 <- grid_random(mixture(), size = 1000)
range(mix_grid_1$mixture)
## [1] 0.001490161 0.999741096
```

However, in some cases, the tune package overrides the default ranges for specific models. If the grid function uses a parameters object created from a model or recipe, the ranges may have different defaults (specific to those models). Using the example above, the mixture argument above is different for glmnet models:

```r
library(parsnip)
library(tune)
# When used with glmnet, the range is [0.05, 1.00]
glm_mod <-
  linear_reg(mixture = tune()) %>%
  set_engine("glmnet")
set.seed(283)
mix_grid_2 <- grid_random(parameters(glm_mod), size = 1000)
range(mix_grid_2$mixture)
## [1] 0.05141565 0.99975404
```
Value

A tibble. There are columns for each parameter and a row for every parameter combination.

Examples

# filter arg will allow you to filter subsequent grid data frame based on some condition.
p <- parameters(penalty(), mixture())
grid_regular(p)
grid_regular(p, filter = penalty <= .01)

# Will fail due to unknowns:
# grid_regular(mtry(), min_n())

grid_regular(penalty(), mixture())
grid_regular(penalty(), mixture(), levels = 3:4)
grid_regular(penalty(), mixture(), levels = c(mixture = 4, penalty = 3))
grid_random(penalty(), mixture())

---

<table>
<thead>
<tr>
<th>Laplace</th>
<th>Laplace correction parameter</th>
</tr>
</thead>
</table>

Description

Laplace correction for smoothing low-frequency counts.

Usage

Laplace(range = c(0, 3), trans = NULL)

Arguments

- **range**: A two-element vector holding the defaults for the smallest and largest possible values, respectively.
- **trans**: A `trans` object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

Details

This parameter is often used to correct for zero-count data in tables or proportions.

Value

A function with classes "quant_param" and "param"

Examples

Laplace()
### learn_rate

**Learning rate**

**Description**

The parameter is used in boosting methods (parsnip::boost_tree()) or some types of neural network optimization methods.

**Usage**

```r
learn_rate(range = c(-10, -1), trans = log10_trans())
```

**Arguments**

- `range`: A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- `trans`: A `trans` object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

**Details**

The parameter is used on the log10 scale. The units for the `range` function are on this scale.

`learn_rate()` corresponds to *eta* in xgboost.

**Examples**

```r
learn_rate()
```

### max_times

**Word frequencies for removal**

**Description**

Used in textrecipes::step_tokenfilter().

**Usage**

```r
max_times(range = c(1L, as.integer(10^5)), trans = NULL)
```

```r
min_times(range = c(0L, 1000L), trans = NULL)
```
Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Examples

max_tokens()
min_times()

max_tokens

Maximum number of retained tokens

Description

Used in textrecipes::step_tokenfilter().

Usage

max_tokens(range = c(0L, as.integer(10^3)), trans = NULL)

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Examples

max_tokens()
**min_dist**

*Parameter for the effective minimum distance between embedded points*

**Description**

Used in `embed::step_umap()`.

**Usage**

```r
min_dist(range = c(-4, 0), trans = log10_trans())
```

**Arguments**

- **range**: A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- **trans**: A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

**Examples**

```r
min_dist()
```

---

**min_unique**

*Number of unique values for pre-processing*

**Description**

Some pre-processing parameters require a minimum number of unique data points to proceed.

**Usage**

```r
min_unique(range = c(5L, 15L), trans = NULL)
```

**Arguments**

- **range**: A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- **trans**: A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

**Examples**

```r
min_unique()
```
mixture | Mixture of penalization terms

**Description**

A numeric parameter function representing the relative amount of penalties (e.g. L1, L2 etc) in regularized models.

**Usage**

```
mixture(range = c(0, 1), trans = NULL)
```

**Arguments**

- `range` | A two-element vector holding the defaults for the smallest and largest possible values, respectively.
- `trans` | A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.

**Details**

This parameter is used for regularized or penalized models such as `parsnip::linear_reg()`, `parsnip::logistic_reg()`, and others. It is formulated as the proportion of L1 regularization (i.e. lasso) in the model. In the `glmnet` model, `mixture = 1` is a pure lasso model while `mixture = 0` indicates that ridge regression is being used.

**Examples**

```
mixture()
```

---

mtry | Number of randomly sampled predictors

**Description**

The number of predictors that will be randomly sampled at each split when creating tree models.

**Usage**

```
mtry(range = c(1L, unknown()), trans = NULL)
mtry_long(range = c(0L, unknown()), trans = log10_trans())
```
neighbors

Description

The number of neighbors is used for models (parsnip::nearest_neighbor()), imputation (recipes::step_knnimpute()), and dimension reduction (recipes::step_isomap()).

Usage

neighbors(range = c(1L, 10L), trans = NULL)

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.
trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Details

A static range is used but a broader range should be used if the data set is large or more neighbors are required.

Examples

neighbors()
Tools for creating new parameter objects

**Description**

These functions are used to construct new parameter objects. Generally, these functions are called from higher level parameter generating functions like `mtry()`.

**Usage**

```r
new_quant_param(
  type = c("double", "integer"),
  range,
  inclusive,
  default = unknown(),
  trans = NULL,
  values = NULL,
  label = NULL,
  finalize = NULL
)
```

```r
new_qual_param(
  type = c("character", "logical"),
  values,
  default = unknown(),
  label = NULL,
  finalize = NULL
)
```

**Arguments**

- **type**: A single character value. For quantitative parameters, valid choices are "double" and "integer" while for qualitative factors they are "character" and "logical".
- **range**: A two-element vector with the smallest or largest possible values, respectively. If these cannot be set when the parameter is defined, the unknown() function can be used. If a transformation is specified, these values should be in the transformed units.
- **inclusive**: A two-element logical vector for whether the range values should be inclusive or exclusive.
- **default**: A single value the same class as type for the default parameter value. unknown() can also be used here.
- **trans**: A `trans` object from the `scales` package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. Create custom transforms with `scales::trans_new()`.
- **values**: A vector of possible values that is required when type is "character" or "logical" but optional otherwise. For quantitative parameters, these override the range when generating sequences if set.
num_breaks

| label | An optional named character string that can be used for printing and plotting. The name should match the object name (e.g. "mtry", "neighbors", etc.) |
| finalize | A function that can be used to set the data-specific values of a parameter (such as the range). |

**Value**

An object of class "param" with the primary class being either "quant_param" or "qual_param". The range element of the object is always converted to a list with elements "lower" and "upper".

**Examples**

```r
# Create a function that generates a quantitative parameter corresponding to the number of subgroups.
num_subgroups <- function(range = c(1L, 20L), trans = NULL) {
  new_quant_param(
    type = "integer",
    range = range,
    inclusive = c(TRUE, TRUE),
    trans = trans,
    label = c(num_subgroups = "# Subgroups"),
    finalize = NULL
  )
}

num_subgroups()
num_subgroups(range = c(3L, 5L))

# Custom parameters instantly have access to sequence generating functions
value_seq(num_subgroups(), 5)
```

---

**num_breaks**  
**Number of cut-points for binning**

**Description**

This parameter controls how many bins are used when discretizing predictors.

**Usage**

```r
num_breaks(range = c(2L, 10L), trans = NULL)
```
num_comp

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Examples

num_breaks()

num_comp | Number of new features
---------|---------------------

Description

The number of derived predictors from models or feature engineering methods.

Usage

num_comp(range = c(1L, unknown()), trans = NULL)
num_terms(range = c(1L, unknown()), trans = NULL)

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Details

Since the scale of these parameters often depends on the number of columns in the data set, the upper bound is set to unknown. For example, the number of PCA components is limited by the number of columns and so on.

The difference between num_comp() and num_terms() is semantics.

Examples

num_terms()
num_terms(c(2L, 10L))
### num_hash

**Text hashing parameters**

**Description**

Used in `textrecipes::step_texthash()`.

**Usage**

```r
num_hash(range = c(8L, 12L), trans = log2_trans())
signed_hash(values = c(TRUE, FALSE))
```

**Arguments**

- `range` A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- `trans` A `trans` object from the `scales` package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.
- `values` A vector of possible values (TRUE or FALSE).

**Examples**

```r
num_hash()
signed_hash()
```

### num_tokens

**Parameter to determine number of tokens in ngram**

**Description**

Used in `textrecipes::step_ngram()`.

**Usage**

```r
num_tokens(range = c(1, 3), trans = NULL)
```

**Arguments**

- `range` A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- `trans` A `trans` object from the `scales` package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`. 
Examples

```r
num_tokens()
```

---

**over_ratio**

*Parameters for class-imbalance sampling*

**Description**

For up- and down-sampling methods, these parameters control how much data are added or removed from the training set.

**Usage**

```r
over_ratio(range = c(0.8, 1.2), trans = NULL)
under_ratio(range = c(0.8, 1.2), trans = NULL)
```

**Arguments**

- `range` A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.
- `trans` A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in range. If no transformation, `NULL`.

**Details**

See `recipes::step_upsample()` and `recipes::step_downsample()` for the interpretation of these parameters.

**Examples**

```r
under_ratio()
over_ratio()
```
parameters

Information on tuning parameters within an object

Description

Information on tuning parameters within an object

Usage

parameters(x, ...)

## Default S3 method:
parameters(x, ...)

## S3 method for class 'param'
parameters(x, ...)

## S3 method for class 'list'
parameters(x, ...)

param_set(x, ...)

Arguments

x An object, such as a list of param objects or an actual param object.

... Only used for the param method so that multiple param objects can be passed to the function.

penalty

Amount of regularization/penalization

Description

A numeric parameter function representing the amount of penalties (e.g. L1, L2 etc) in regularized models.

Usage

penalty(range = c(-10, 0), trans = log10_trans())

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively. Note that these are in transformed units.

trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.
predictor_prop

Details

This parameter is used for regularized or penalized models such as \texttt{parsnip::linear_reg()}, \texttt{parsnip::logistic_reg()}, and others.

Examples

\texttt{penalty()}

\begin{itemize}
\item \texttt{predictor_prop} \textit{Proportion of predictors}
\end{itemize}

Description

The parameter is used in models where a parameter is the proportion of predictor variables.

Usage

\texttt{predictor_prop(range = c(0, 1), trans = NULL)}

Arguments

- \texttt{range} \hfill A two-element vector holding the \textit{defaults} for the smallest and largest possible values, respectively.
- \texttt{trans} \hfill A \texttt{trans} object from the \texttt{scales} package, such as \texttt{scales::log10_trans()} or \texttt{scales::reciprocal_trans()}. If not provided, the default is used which matches the units used in \texttt{range}. If no transformation, \texttt{NULL}.

Details

\texttt{predictor_prop()} is used in \texttt{step_pls()}.

Examples

\texttt{predictor_prop()}
prune_method

MARS pruning methods

Description
MARS pruning methods

Usage
prune_method(values = values_prune_method)

values_prune_method

Arguments
values A character string of possible values. See values_prune_method in examples below.

Format
An object of class character of length 6.

Details
This parameter is used in parsnip::mars().

Examples
values_prune_method
prune_method()

---

range_validate

Tools for working with parameter ranges

Description
Setters, getters, and validators for parameter ranges.

Usage
range_validate(object, range, ukn_ok = TRUE)

range_get(object, original = TRUE)

range_set(object, range)
Arguments

- **object**: An object with class `quant_param`.
- **range**: A two-element numeric vector or list (including `Inf`). Values can include `unknown()` when `ukn_ok = TRUE`.
- **ukn_ok**: A single logical for whether `unknown()` is an acceptable value.
- **original**: A single logical. Should the range values be in the natural units (TRUE) or in the transformed space (FALSE, if applicable)?

Value

- `range_validate()` returns the new range if it passes the validation process (and throws an error otherwise).
- `range_get()` returns the current range of the object.
- `range_set()` returns an updated version of the parameter object with a new range.

Examples

```r
library(dplyr)

my_lambda <- penalty() %>%
  value_set(-4:-1)

try(
  range_validate(my_lambda, c(-10, NA)), silent = TRUE
) %>%
  print()

range_get(my_lambda)

my_lambda %>%
  range_set(c(-10, 2)) %>%
  range_get()
```

---

**rbf_sigma**  
*Kernel parameters*

Description

Parameters related to the radial basis or other kernel functions.

Usage

```r
rbf_sigma(range = c(-10, 0), trans = log10_trans())

scale_factor(range = c(-10, -1), trans = log10_trans())

kernel_offset(range = c(0, 2), trans = NULL)
```
smoothness

Arguments

range  A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans  A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Details

degree() can also be used in kernel functions.

Examples

smoothness()

smoothness

Kernel Smoothness

Description

Used in discrim::naive_Bayes().

Usage

smoothness(range = c(0.5, 1.5), trans = NULL)

Arguments

range  A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans  A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Examples

smoothness()
### surv_dist

**Parametric distributions for censored data**

**Description**
Parametric distributions for censored data

**Usage**

```r
surv_dist(values = values_surv_dist)

values_surv_dist
```

**Arguments**

- `values` A character string of possible values. See `values_surv_dist` in examples below.

**Format**
An object of class `character` of length 6.

**Details**
This parameter is used in `parsnip:::surv_reg()`.

**Examples**

```r
values_surv_dist
surv_dist()
```

---

### threshold

**General thresholding parameter**

**Description**
In a number of cases, there are arguments that are threshold values for data falling between zero and one. For example, `recipes::step_other()` and so on.

**Usage**

```r
threshold(range = c(0, 1), trans = NULL)
```
Arguments

range   A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans  A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Examples

threshold()

token     Token types

description
Token types

Usage

token(values = values_token)

values_token

Arguments

values   A character string of possible values. See values_token in examples below.

Format

An object of class character of length 12.

Details

This parameter is used in textrecipes::step_tokenize().

Examples

values_token
token()
trees

Parameter functions related to tree- and rule-based models.

Description

These are parameter generating functions that can be used for modeling, especially in conjunction with the `parsnip` package.

Usage

```r
trees(range = c(1L, 2000L), trans = NULL)
min_n(range = c(2L, 40L), trans = NULL)
sample_size(range = c(unknown(), unknown()), trans = NULL)
sample_prop(range = c(1/10, 1), trans = NULL)
loss_reduction(range = c(-10, 1.5), trans = log10_trans())
tree_depth(range = c(1L, 15L), trans = NULL)
prune(values = c(TRUE, FALSE))
cost_complexity(range = c(-10, -1), trans = log10_trans())
```

Arguments

- `range`: A two-element vector holding the defaults for the smallest and largest possible values, respectively.
- `trans`: A trans object from the scales package, such as `scales::log10_trans()` or `scales::reciprocal_trans()`. If not provided, the default is used which matches the units used in `range`. If no transformation, `NULL`.
- `values`: A vector of possible values (TRUE or FALSE).

Details

These functions generate parameters that are useful when the model is based on trees or rules.

- `trees()`: The number of trees contained in a random forest or boosted ensemble. In the latter case, this is equal to the number of boosting iterations. (See `parsnip::rand_forest()` and `parsnip::boost_tree()`).
- `min_n()`: The minimum number of data points in a node that are required for the node to be split further. (See `parsnip::rand_forest()` and `parsnip::boost_tree()`).
- `sample_size()`: The size of the data set used for modeling within an iteration of the modeling algorithm, such as stochastic gradient boosting. (See `parsnip::boost_tree()`).
• `sample_prop()`: The same as `sample_size()` but as a proportion of the total sample.
• `loss_reduction()`: The reduction in the loss function required to split further. (See `parsnip::boost_tree()`). This corresponds to gamma in xgboost.
• `tree_depth()`: The maximum depth of the tree (i.e. number of splits). (See `parsnip::boost_tree()`).
• `prune()`: A logical for whether a tree or set of rules should be pruned.
• `cost_complexity()`: The cost-complexity parameter in classical CART models.

Examples

```r
trees()
min_n()
sample_size()
loss_reduction()
tree_depth()
prune()
cost_complexity()
```

---

unknown | Placeholder for unknown parameter values

Description

`unknown()` creates an expression used to signify that the value will be specified at a later time.

Usage

```r
unknown()
is_unknown(x)
has_unknowns(object)
```

Arguments

- `x`  
  An object or vector or objects to test for unknown-ness.
- `object`  
  An object of class `param`.

Value

`unknown()` returns expression value for `unknown()`.

`is_unknown()` returns a vector of logicals as long as `x` that are TRUE is the element of `x` is unknown, and FALSE otherwise.

`has_unknowns()` returns a single logical indicating if the range of a `param` object has any unknown values.
Examples

# Just returns an expression
unknown()

# Of course, true!
is_unknown(unknown())

# Create a range with a minimum of 1
# and an unknown maximum
range <- c(1, unknown())

range

# The first value is known, the
# second is not
is_unknown(range)

# mtry()'s maximum value is not known at
# creation time
has_unknowns(mtry())

update.parameters  
Update a single parameter in a parameter set

Description

Update a single parameter in a parameter set

Usage

## S3 method for class 'parameters'
update(object, ...)

Arguments

object  
A parameter set.

...  
One or more unquoted named values separated by commas. The names should correspond to the id values in the parameter set. The values should be parameter objects or NA values.

Value

The modified parameter set.
value_validate

Examples

```r
params <- list(lambda = penalty(), alpha = mixture(), 'rand forest' = mtry())
pset <- parameters(params)
pset

update(pset, 'rand forest' = finalize(mtry(), iris), alpha = mixture(c(.1, .2)))
```

value_validate Tools for working with parameter values

Description

Setters and validators for parameter values. Additionally, tools for creating sequences of parameter values and for transforming parameter values are provided.

Usage

```r
value_validate(object, values)
value_seq(object, n, original = TRUE)
value_sample(object, n, original = TRUE)
value_transform(object, values)
value_inverse(object, values)
value_set(object, values)
```

Arguments

- `object` An object with class `quant_param`.
- `values` A numeric vector or list (including Inf). Values cannot include `unknown()`. For `value_validate()`, the units should be consistent with the parameter object’s definition.
- `n` An integer for the (maximum) number of values to return. In some cases where a sequence is requested, the result might have less than `n` values. See Details.
- `original` A single logical. Should the range values be in the natural units (TRUE) or in the transformed space (FALSE, if applicable)?

Details

For sequences of integers, the code uses `unique(floor(seq(min,max,length.out = n)))` and this may generate an uneven set of values shorter than `n`. This also means that if `n` is larger than the range of the integers, a smaller set will be generated. For qualitative parameters, the first `n` values are returned.
If a single value sequence is requested, the default value is returned (if any). If no default is specified, the regular algorithm is used.

For quantitative parameters, any values contained in the object are sampled with replacement. Otherwise, a sequence of values between the range values is returned. It is possible that less than \( n \) values are returned.

For qualitative parameters, sampling of the values is conducted with replacement. For qualitative values, a random uniform distribution is used.

Value

value_validate() throws an error or silently returns values if they are contained in the values of the object.

value_transform() and value_inverse() return a vector of numeric values.

value_seq() and value_sample() return a vector of values consistent with the type field of object.

Examples

```r
library(dplyr)

penalty() %>% value_set(-4:-1)

# Is a specific value valid?
penalty()
penalty() %>% range_get()
value_validate(penalty(), 17)

# get a sequence of values
cost_complexity()
cost_complexity() %>% value_seq(4)
cost_complexity() %>% value_seq(4, original = FALSE)

on_log_scale <- cost_complexity() %>% value_seq(4, original = FALSE)
nat_units <- value_inverse(cost_complexity(), on_log_scale)
nat_units
value_transform(cost_complexity(), nat_units)

# random values in the range
set.seed(3666)
cost_complexity() %>% value_sample(2)
```

weight

Parameter for "double normalization" when creating token counts

Description

Used in textrecipes::step_tf().
weight_func

Usage

weight(range = c(-10, 0), trans = log10_trans())

Arguments

range A two-element vector holding the defaults for the smallest and largest possible values, respectively.

trans A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in range. If no transformation, NULL.

Examples

weight()

weight_func

Kernel functions for distance weighting

Description

Kernel functions for distance weighting

Usage

weight_func(values = values_weight_func)

values_weight_func

Arguments

values A character string of possible values. See values_weight_func in examples below.

Format

An object of class character of length 10.

Details

This parameter is used in parsnip::nearest_neighbors().

Examples

values_weight_func
weight_func()
### weight_scheme

Term frequency weighting methods

**Usage**

```r
weight_scheme(values = values_weight_scheme)
```

**Values**

`values_weight_scheme`

**Arguments**

- `values`: A character string of possible values. See `values_weight_scheme` in examples below.

**Format**

An object of class character of length 5.

**Details**

This parameter is used in `textrecipes::step_tf()`.

**Examples**

```r
values_weight_scheme
weight_scheme()
```

---

### window_size

Parameter for the moving window size

**Description**

Used in `recipes::step_window()`.

**Usage**

```r
window_size(range = c(3L, 11L), trans = NULL)
```
**Arguments**

*range*  
A two-element vector holding the *defaults* for the smallest and largest possible values, respectively.

*trans*  
A trans object from the scales package, such as scales::log10_trans() or scales::reciprocal_trans(). If not provided, the default is used which matches the units used in *range*. If no transformation, NULL.

**Examples**

`window_size()`
Index

*Topic datasets
  activation, 3
  Chicago, 3
  prune_method, 29
  surv_dist, 32
  token, 33
  weight_func, 39
  weight_scheme, 40
activation, 3
batch_size (dropout), 7
Chicago, 3
cost, 4
cost_complexity (trees), 34
deg_free, 6
degree, 5
degree_int (degree), 5
dist_power, 6
dropout, 7
epochs (dropout), 7
finalize, 8
freq_cut, 10
get_batch_sizes (finalize), 8
get_log_p (finalize), 8
get_n (finalize), 8
get_n_frac (finalize), 8
get_n_frac_range (finalize), 8
get_p (finalize), 8
get_rbf_range (finalize), 8
grid_latin_hypercube
  (grid_max_entropy), 11
grid_max_entropy, 11
grid_random (grid_regular), 14
grid_regular, 14
has_unknowns (unknown), 35
hidden_units (dropout), 7
is_unknown (unknown), 35
kernel_offset (rbf_sigma), 30
kernlab::sigest(), 8, 9
Laplace, 16
learn_rate, 17
loss_reduction (trees), 34
make_regular_grid (grid_regular), 14
max_times, 17
max_tokens, 18
min_dist, 19
min_n (trees), 34
min_times (max_times), 17
min_unique, 19
mixture, 20
mtry, 20
mtry(), 12, 15, 22
mtry_long (mtry), 20
neighbors, 21
new-param, 22
new_qual_param (new-param), 22
new_quant_param (new-param), 22
num_breaks, 23
num_comp, 24
num_hash, 25
num_terms (num_comp), 24
num_tokens, 25
over_ratio, 26
param_set (parameters), 27
parameters, 27
penalty, 27
penalty(), 12, 15
predictor_prop, 28
INDEX

prod_degree (degree), 5
prune (trees), 34
prune_method, 29

range_get (range_validate), 29
range_set (range_validate), 29
range_validate, 29
rbf_sigma, 30

sample_prop (trees), 34
sample_size (trees), 34
scale_factor (rbf_sigma), 30
scales::log10_trans(), 22
scales::reciprocal_trans(), 22
scales::trans_new(), 22
signed_hash (num_hash), 25
smoothness, 31
spline_degree (degree), 5
stations (Chicago), 3
surv_dist, 32
svm_margin (cost), 4

threshold, 32
token, 33
tree_depth (trees), 34
trees, 34

under_ratio (over_ratio), 26
unique_cut (freq_cut), 10
unknown, 35
update.parameters, 36

value_inverse (value_validate), 37
value_sample (value_validate), 37
value_seq (value_validate), 37
value_set (value_validate), 37
value_transform (value_validate), 37
value_validate, 37
values_activation (activation), 3
values_prune_method (prune_method), 29
values_surv_dist (surv_dist), 32
values_token (token), 33
values_weight_func (weight_func), 39
values_weight_scheme (weight_scheme), 40

weight, 38
weight_func, 39
weight_scheme, 40
window_size, 40