Package ‘densratio’

June 30, 2019

Type Package
Version 0.2.1
Title Density Ratio Estimation
Description The estimated density ratio function can be used in many applications such as anomaly detection, change-point detection, covariate shift adaptation.

URL https://github.com/hoxo-m/densratio
BugReports https://github.com/hoxo-m/densratio/issues
License MIT + file LICENSE
Imports utils
Suggests graphics, knitr, mvtnorm, rmarkdown, stats, testthat
RoxygenNote 6.1.1
VignetteBuilder knitr
Encoding UTF-8
NeedsCompilation no
Author Koji Makiyama [aut, cre]
Maintainer Koji Makiyama <hoxo.smile@gmail.com>
Repository CRAN
Date/Publication 2019-06-30 17:20:03 UTC

R topics documented:

densratio ......................................................... 2
KLIEP ............................................................ 3
RuLSIF ............................................................ 3
squared_euclid_distance ................................. 4
uLSIF ............................................................ 5

Index 6
densratio

Estimate Density Ratio \( p(x)/q(x) \)

Description

Estimate Density Ratio \( p(x)/q(x) \)

Usage

densratio(x1, x2, method = c("uLSIF", "RuLSIF", "KLIEP"),
sigma = "auto", lambda = "auto", alpha = 0.1, kernel_num = 100,
fold = 5, verbose = TRUE)

Arguments

- **x1**: numeric vector or matrix. Data from a numerator distribution \( p(x) \).
- **x2**: numeric vector or matrix. Data from a denominator distribution \( q(x) \).
- **method**: "uLSIF" (default), "RuLSIF", or "KLIEP".
- **sigma**: positive numeric vector. Search range of Gaussian kernel bandwidth.
- **lambda**: positive numeric vector. Search range of regularization parameter for uLSIF and RuLSIF.
- **alpha**: numeric in \([0, 1]\). Relative parameter for RuLSIF. Default 0.1.
- **kernel_num**: positive integer. Number of kernels.
- **fold**: positive integer. Numer of the folds of cross validation for KLIEP.
- **verbose**: logical (default TRUE).

Value

densratio object that contains a function to compute estimated density ratio.

Examples

```r
x1 <- rnorm(200, mean = 1, sd = 1/8)
x2 <- rnorm(200, mean = 1, sd = 1/2)
densratio_obj <- densratio(x1, x2)

new_x <- seq(0, 2, by = 0.05)
estimated_density_ratio <- densratio_obj$compute_density_ratio(new_x)

plot(new_x, estimated_density_ratio, pch=19)
```
**KLIEP**

Estimate Density Ratio $p(x)/q(x)$ by KLIEP (Kullback-Leibler Importance Estimation Procedure)

**Description**

Estimate Density Ratio $p(x)/q(x)$ by KLIEP (Kullback-Leibler Importance Estimation Procedure)

**Usage**

```r
KLIEP(x1, x2, sigma = "auto", kernel_num = 100, fold = 5, verbose = TRUE)
```

**Arguments**

- `x1`: numeric vector or matrix. Data from a numerator distribution $p(x)$.
- `x2`: numeric vector or matrix. Data from a denominator distribution $q(x)$.
- `sigma`: positive numeric vector. Search range of Gaussian kernel bandwidth.
- `kernel_num`: positive integer. Number of kernels.
- `fold`: positive integer. Number of the folds of cross validation.
- `verbose`: logical (default TRUE).

**Value**

KLIEP object that contains a function to compute estimated density ratio.

---

**RuLSIF**

Estimate alpha-Relative Density Ratio $p(x)/(\alpha p(x) + (1-\alpha) q(x))$ by RuLSIF (Relative unconstrained Least-Square Importance Fitting)

**Description**

Estimate alpha-Relative Density Ratio $p(x)/(\alpha p(x) + (1-\alpha) q(x))$ by RuLSIF (Relative unconstrained Least-Square Importance Fitting)

**Usage**

```r
RuLSIF(x1, x2, sigma = 10^seq(-3, 1, length.out = 9),
       lambda = 10^seq(-3, 1, length.out = 9), alpha = 0.1,
       kernel_num = 100, verbose = TRUE)
```
squared_euclid_distance

Arguments

x1: numeric vector or matrix. Data from a numerator distribution p(x).
x2: numeric vector or matrix. Data from a denominator distribution q(x).
sigma: positive numeric vector. Search range of Gaussian kernel bandwidth.
lambda: positive numeric vector. Search range of regularization parameter.
alpha: numeric value from 0.0 to 1.0. Relative parameter. Default 0.1.
kernel_num: positive integer. Number of kernels.
verbose: logical. Default TRUE.

Value

RuLSIF object which has ‘compute_density_ratio()’.

squared_euclid_distance

Compute Squared Euclid Distance

Description

Compute Squared Euclid Distance

Usage

squared_euclid_distance(x, y)

Arguments

x: a numeric vector.
y: a numeric vector.

Value

squared Euclid distance
uLSIF

Estimate Density Ratio $p(x)/q(x)$ by uLSIF (unconstrained Least-Square Importance Fitting)

Description
Estimate Density Ratio $p(x)/q(x)$ by uLSIF (unconstrained Least-Square Importance Fitting)

Usage
uLSIF(x1, x2, sigma = 10^seq(-3, 1, length.out = 9),
lambda = 10^seq(-3, 1, length.out = 9), kernel_num = 100,
verbose = TRUE)

Arguments
- x1: numeric vector or matrix. Data from a numerator distribution $p(x)$.
- x2: numeric vector or matrix. Data from a denominator distribution $q(x)$.
- sigma: positive numeric vector. Search range of Gaussian kernel bandwidth.
- lambda: positive numeric vector. Search range of regularization parameter.
- kernel_num: positive integer. Number of kernels.
- verbose: logical (default TRUE).

Value
uLSIF object that contains a function to compute estimated density ratio.
Index

densratio, 2
KLIEP, 3
RuLSIF, 3
squared_euclid_distance, 4
uLSIF, 5