

Package ‘APFr’

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Type Package

Title Multiple Testing Approach using Average Power Function (APF) and Bayes FDR Robust Estimation

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Imports stats (>= 3.5.2), graphics (>= 3.5.2)

Description Implements a multiple testing approach to the choice of a threshold γ on the p-values using the Average Power Function (APF) and Bayes False Discovery Rate (FDR) robust estimation. Function `apf_fdr()` estimates both quantities from either raw data or p-values. Function `apf_plot()` produces smooth graphs and tables of the relevant results. Details of the methods can be found in Quatto P, Margaritella N, et al. (2019) <[doi:10.1177/0962280219844288](https://doi.org/10.1177/0962280219844288)>.

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apf_fdr	<i>Implementation of APF and FDR robust estimation</i>
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Description

apf_fdr returns robust estimates of the Average Power Function (APF) and Bayes False Discovery Rate (FDR) for each value of the threshold Gamma on the p-value and Tau on the correlation coefficient.

Usage

```
apf_fdr(data, type = "datf", corr = "spearman", lobs = 0,
        seed = 111, gamm = c(1e-04, 0.1, 0.002))
```

Arguments

data	Either a vector, matrix or dataframe.
type	Set "datf" if data is a matrix or dataframe containing the raw data (columns); "pv1" for a vector of p-values.
corr	The type of correlation to use when type = "datf". It can be set to either "spearman" or "pearson".
lobs	When type = "pv1", it indicates the number of datapoints used to compute the correlations.
seed	A seed (natural number) for the resampling.
gamm	The threshold gamma on the p-values to explore (typically ≤ 0.05 or 0.1). A min, max and step length value need to be set.

Value

A list with four elements. A vector APF_gamma containing the robust estimates of APF (5th quantiles) for all the gamma values set in gamm. A vector FDR_gamma with the robust estimates of Bayes FDR (95th quantiles). A vector tau_gamma with the correlation coefficients *tau* for each gamma value explored and another vector with the relative values gamma (gammaval).

References

Quatto, P, Margaritella, N, et al. Brain networks construction using Bayes FDR and average power function. *Stat Methods Med Res*. Published online May 14th, 2019; DOI:10.1177/0962280219844288.

Examples

```
data("Ex1")
APF_lst <- apf_fdr(Ex1,"pv1",lobs=100)
# The example uses the dataset Ex1 (in the APFr package) which is
# a vector of 100 p-values. The number of datapoints used to
# compute each p-value in this example is set to 100. As a result,
# a list of 4 objects is returned.
```

apf_plot

*Generate smooth graphs for the APF and FDR estimates***Description**

apf_plot returns a graph with Average Power Function (APF), Bayes False Discovery Rate (FDR) and APF vs. FDR. In addition, when tab = TRUE, a table containing APF, FDR, tau and gamma values for a selected subset of APF and FDR is printed.

Usage

```
apf_plot(APF_lst, tab = TRUE, APF_inf = 0.5, FDR_sup = 0.05)
```

Arguments

APF_lst	The output from the apf_fdr function.
tab	If TRUE, a table with relevant values of APF, FDR, tau and gamma is printed.
APF_inf	Sets the minimum value of APF to appear in the table when tab = TRUE.
FDR_sup	Sets the maximum value of Bayes FDR to appear in the table when tab = TRUE.

Value

Smooth graphs for APF vs Gamma (left), FDR vs Gamma (centre) and APF vs FDR (right). Regions where $FDR \leq FDR_sup$ and $APF \geq APF_inf$ (if presents) are highlighted in yellow and printed in a table (if tab = TRUE) together with the relative values of *gamma* and *tau*.

References

Quatto, P, Margaritella, N, et al. Brain networks construction using Bayes FDR and average power function. *Stat Methods Med Res*. Published online May 14th, 2019; DOI:10.1177/0962280219844288.

Examples

```
data("Ex2")
apf_plot(Ex2)
# Ex2 is an example of output obtained
# from the apf_fdr() function.
```

Ex1

Example dataset 1

Description

A dataset containing 100 simulated p-values, 70 from a $N(2,1)$ and 30 from a $N(0,1)$.

Usage

Ex1

Format

A vector containing 100 p-values.

References

Quatto, P, Margaritella, N, et al. Brain networks construction using Bayes FDR and average power function. *Stat Methods Med Res*. Published online May 14th, 2019; DOI:10.1177/0962280219844288.

Examples

data(Ex1)

Ex2

Example 2

Description

A list containing 4 vectors. This is an example of output obtained with `apf_fdr()` to use with `apf_plot()`.

Usage

Ex2

Format

A list containing 4 vectors called `APF_gamma`, `FDR_gamma`, `tau_gamma`, `gammaval`.

References

Quatto, P, Margaritella, N, et al. Brain networks construction using Bayes FDR and average power function. *Stat Methods Med Res*. Published online May 14th, 2019; DOI:10.1177/0962280219844288.

Examples

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