Package ‘ROCS’

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Type Package

Title Receiver Operating Characteristics Surface

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Description Plots the Receiver Operating Characteristics Surface for high-throughput class-skewed data, calculates the Volume under the Surface (VUS) and the FDR-Controlled Area Under the Curve (FCAUC), and conducts tests to compare two ROC surfaces.

License GPL-2

Depends rgl

NeedsCompilation no

Repository CRAN

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R topics documented:

ROCS-package .................................................. 2
fcauc.comp.fptp ........................................... 2
fcauc.fptp ..................................................... 3
fcauc.x ....................................................... 4
rocs.fptp ..................................................... 5
rocs.x ....................................................... 6
test.rocs .................................................... 7

Index 9
ROCS-package  
*Receiver Operating Characteristics Surface for class-skewed data*

**Description**

The package constructs Receiver Operating Characteristics Surface (ROCS) using the false positive rate (FPR), true positive rate (TPR) and the false discovery rate (FDR). It computes the volume under the surface (VUS) and FDR-controlled area under the curve (FCAUC) to gauge the separability between two classes while taking into account the proportion of false discoveries.

**Details**

- **Package:** ROCS
- **Type:** Package
- **Version:** 1.0
- **Date:** 2012-02-12
- **License:** GPL 2.0 or later

Major functions are rocs.x and fcauc.x.

**Author(s)**

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**Usage**

```r
fcauc.comp.fptp(roc.1, roc.2, FDR.cut = 0.2, lwd = 3,
colors = c("blue", "green", "cyan", "red"),
exp.labels = c("experiment 1", "experiment 2"))
```
Arguments

- roc 1: A list object with three components: TP, FP and TDR, each being a vector.
- roc 2: A list object with three components: TP, FP and TDR, each being a vector.
- FDR.cut: The cutoff value of FDR.
- lwd: The line width parameter to be passed on to the function lines().
- colors: A vector of at least four colors. It is used for the coloring of the two ROC curves.
- exp.labels: Experiment labels in the plot.

Value

No value is returned.

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References


See Also

fcauc.fptp()

Description

The function plots the ROC curve using user-provided FPR, TPR, FDR values. It shades the area corresponding to acceptable FDR level. The FDR-controlled area under the curve (FCAUC) is calculated for the shaded area.

Usage

fcauc.fptp(FP, TP, TDR, FDR.cut = 0.2, do.plot=TRUE)

Arguments

- FP: Vector of false positive rate.
- TP: Vector of true positive rate.
- TDR: Vector of true discovery rate.
- FDR.cut: The cutoff value of FDR, for the purpose of FCAUC calculation.
- do.plot: Whether to generate the plot.
Value

The FCAUC value is returned.

Author(s)

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References


See Also

fcauc.x

Description

The function plots the ROC curve. It shades the area corresponding to acceptable FDR level. The FDR-controlled area under the curve (FCAUC) is calculated for the shaded area.

Usage

fcauc.x(x0, x1, FDR.cut = 0.2)

Arguments

x0 Vector; the raw data of the null class.

x1 Vector; the raw data of the non-null class.

FDR.cut The FDR level at which to shade the AUC and calculate the FCAUC.

Value

The FCAUC value is returned.

Author(s)

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References

rocs.fptp

See Also

fcauc.fptp

Examples

# perfect separation
x0<-runif(1000)
x1<-runif(100)+2
fcauc.x(x0, x1)

# partial separation
x0<-rnorm(1000, mean=0, sd=1.5)
x1<-rnorm(100, mean=3, sd=1)
fcauc.x(x0, x1)

rocs.fptp

Plotting Receiver Operating Characteristics Surface with user-provided FPR, TPR & TDR

Description

The function plots the colored ROCS in 3 dimensions using the rgl utilities. It shades the FDR-controlled AUC in the FPR-TPR plain. The VUS of the surface and the FCAUC area are calculated.

Usage

rocs.fptp(FP, TP, TDR, FDR.cut = 0.2)

Arguments

FP Vector of false positive rate.
TP Vector of true positive rate.
TDR Vector of true discovery rate.
FDR.cut The cutoff value of FDR, for the purpose of FCAUC calculation.

Details

The ROCS is the surface spanned by the TPR-FPR-TDR and its projection to the TPR-TDR plain. The volume is between the surface and its projection on the TPR-FDR plain (i.e. the AUC of ROC).

Value

The volume under the surface (VUS) is returned.
**Author(s)**
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**References**

**See Also**
rocs.x

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**rocs.x**

*Calculating Receiver Operating Characteristics Surface from one-dimensional data.*

**Description**
The function plots the colored ROCS in 3 dimensions using the rgl utilities. It shades the FDR-controlled AUC in the FPR-TPR plain. The VUS of the surface and the FCAUC area are calculated. The significance of the VUX is assessed by one-sided permutation test.

**Usage**

rocs.x(x0, x1, s0=NULL, s1=NULL, n.perm = 1000, do.plot = TRUE, FDR.cut=0.2)

**Arguments**

- **x0** Vector; the raw data of the null class.
- **x1** Vector; the raw data of the non-null class.
- **s0** Vector; the confidence level of the class assignment of the null class observations. The length should be the same as x0. The default is NULL, in which case all observations are considered to be assigned without uncertainty.
- **s1** Vector; the confidence level of the class assignment of the non-null class observations. The length should be the same as x0. The default is NULL, in which case all observations are considered to be assigned without uncertainty.
- **n.perm** The number of permutations to assess the significance of the VUX.
- **do.plot** Whether to plot the 3D surface, or just return the VUX.
- **FDR.cut** The FDR level at which to shade the AUC and calculate the FCAUC.

**Details**
The ROCS is the surface spanned by the TPR-FPR-TDR and its projection to the TPR-TDR plain. The volume is between the surface and its projection on the TPR-FDR plain (i.e. the AUC of ROC).
Value

The volume under the surface (VUS) is returned.

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References


See Also

rocs.fptp

Examples

# perfect separation
x0<-runif(1000)
x1<-runif(100)+2
rocs.x(x0, x1)$vus

# partial separation
x0<-rnorm(1000, mean=0, sd=1.5)
x1<-rnorm(100, mean=3, sd=1)
rocs.x(x0, x1)$vus

s0<-runif(length(x0), min=0.9, max=1)
s1<-runif(length(x1), min=0.9, max=1)
rocs.x(x0, x1, s0, s1)$vus

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test.rocs

Testing for significant difference between two ROCS

Description

The null hypothesis being tested is that the two ROCS are generated from populations with equal class-separating power. This function uses a bootstrap-based test.

Usage

test.rocs(x0, x1, z0, z1, B = 1000, do.plot = TRUE)
Arguments

x0 Vector; the raw data of the true-negative class in study 1.
x1 Vector; the raw data of the true-positive class in study 1.
z0 Vector; the raw data of the true-negative class in study 2.
z1 Vector; the raw data of the true-positive class in study 2.
b The number of bootstrap samples to be used in order to estimate the spread of the distribution under the null hypothesis.
do.plot Whether to plot the spread based on bootstrap samples.

Value

The p-value of the test is returned.

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References


Examples

x0<-rnorm(1000, mean=0, sd=1.5)
x1<-rnorm(100, mean=3, sd=1)

z0<-rnorm(800, mean=0, sd=1.5)
z1<-rnorm(80, mean=3.25, sd=1)

test.rocs(x0, x1, z0, z1, B=1000)
Index

*Topic **classif**
  - fcauc.comp.fptp, 2
  - fcauc.fptp, 3
  - fcauc.x, 4
  - rocs.fptp, 5
  - rocs.x, 6
  - test.rocs, 7

*Topic **package**
  - ROCS-package, 2

  - fcauc.comp.fptp, 2
  - fcauc.fptp, 3
  - fcauc.x, 4

  - ROCS (ROCS-package), 2
  - ROCS-package, 2
  - rocs.fptp, 5
  - rocs.x, 6

  - test.rocs, 7