# Package ‘tpAUC’

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**Type** Package

**Title** Estimation and Inference of Two-Way pAUC, pAUC and pODC

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**Description** Tools for estimating and inferring two-way partial area under receiver operating characteristic curves (two-way pAUC), partial area under receiver operating characteristic curves (pAUC), and partial area under ordinal dominance curves (pODC). Methods includes Mann-Whitney statistic and Jackknife, etc.

**Imports** pROC, stats, graphics

**Depends** R (>= 3.1.1)

**License** GPL (>= 2)

**LazyData** true

**RoxygenNote** 5.0.1

**URL**

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**NeedsCompilation** no

**Repository** CRAN

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## R topics documented:

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**Description**

Estimate and infer the area of region under ODC curve with pre-specific FNR constraint (FNR-pODC). See Yang et al., 2017 for details.

**Usage**

```r
podc(response, predictor, threshold = 0.9, method = "mw", ci = TRUE, cp = 0.95, smooth = FALSE)
```

**Arguments**

- `response`: a factor, numeric or character vector of responses; typically encoded with 0 (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its levels are not 0/1, the first level will be defaultly regarded as negative.
- `predictor`: a numeric vector of the same length than response, containing the predicted value of each observation. An ordered factor is coerced to a numeric.
- `threshold`: numeric; false negative rate (FNR) constraint.
- `ci`: logic; compute the confidence interval of estimation?
- `cp`: numeric; coverage probability of confidence interval.
- `smooth`: if TRUE, the ODC curve is passed to `smooth` to be smoothed.

**Details**


**Value**

Estimation and Inference of FNR partial ODC.
**Author(s)**

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

**See Also**

`podc.est, podc.ci`

**Examples**

```r
library('pROC')
data(aSAH)
podc(aSAH$outcome, aSAH$s100b, threshold=0.9, method='expect', ci=TRUE, cp=0.95)
```

---

**podc.ci**  
*Partial ODC Inference*

**Description**

Infer the area of region under ordinal dominance curve with pre-specific FNR constraint (FNR-pODC). See Yang et al., 2017 for details.

**Usage**

```r
podc.ci(response, predictor, cp = 0.95, threshold = 0.9, method = "mw")
```

**Arguments**

- `response`: a factor, numeric or character vector of responses; typically encoded with 0 (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its levels are not 0 and 1, the first level will be defaultly regarded as negative.
- `predictor`: a numeric vector of the same length than response, containing the predicted value of each observation. An ordered factor is coerced to a numeric.
- `cp`: numeric; coverage probability of confidence interval.
- `threshold`: numeric; false negative rate (FNR) constraint.

**Details**

Value

Confidence interval of FNR partial ODC.

Author(s)

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

See Also

proc.ci

Examples

```r
library('pROC')
data(aSAH)
podc.ci(aSAH$outcome, aSAH$s100b, method='expect', threshold=0.8, cp=0.9)
```

podc.est  Partial ODC Estimation

Description

Estimate the area of region under ordinal dominance curve with pre-specific FNR constraint (FNR-pODC). See Yang et al., 2017 for details.

Usage

```r
podc.est(response, predictor, threshold = 0.9, method = "Mw", smooth = FALSE)
```

Arguments

- **response**: a factor, numeric or character vector of responses; typically encoded with 0 (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its levels are not 0 and 1, the first level will be defaultly regarded as negative.
- **predictor**: a numeric vector of the same length than response, containing the predicted value of each observation. An ordered factor is coerced to a numeric.
- **threshold**: numeric; false negative rate (FNR) constraint.
- **smooth**: if TRUE, the ODC curve is passed to smooth to be smoothed.
Details

This function estimates FNR partial ODC given response, predictor and pre-specific FNR con-
straint. \textit{Mw}: Mann-Whitney statistic. \textit{expect}: method in Yang et al., 2017 adapted from Wang and

Value

Estimation of FNR partial ODC.

Author(s)

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

See Also

\texttt{proc.est}

Examples

\begin{verbatim}
library('pROC')
data(aSAH)
podc.est(aSAH$outcome, aSAH$s100b, method='expect',threshold=0.8 )
\end{verbatim}

---

proc

\textit{Partial AUC Estimation and Inference}

Description

Estimate and infer the area of region under ROC curve with pre-specific FPR constraint (FPR-
pAUC). See Yang et al., 2017 for details.

Usage

\begin{verbatim}
proc(response, predictor, threshold = 0.9, method = "MW", ci = TRUE,
   cp = 0.95, smooth = FALSE)
\end{verbatim}

Arguments

\begin{itemize}
  \item \texttt{response}: a factor, numeric or character vector of responses; typically encoded with 0
    (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its
    levels are not 0/1, the first level will be defaultly regarded as negative.
  \item \texttt{predictor}: a numeric vector of the same length than response, containing the predicted
    value of each observation. An ordered factor is coerced to a numeric.
  \item \texttt{threshold}: numeric; false positive rate (FPR) constraint.
\end{itemize}

ci: logic; compute the confidence interval of estimation?

cp: numeric; coverage probability of confidence interval.

smooth: if TRUE, the ROC curve is passed to \texttt{smooth} to be smoothed.

Details

This function estimates and infers FPR partial AUC given response, predictor and pre-specific FPR constraint. \texttt{Mw}: Mann-Whitney statistic. \texttt{expect}: method in (2.2) Wang and Chang, 2011. \texttt{jackknife}: jackknife method in Yang et al., 2017.

Value

Estimate and Inference of FPR partial AUC.

Author(s)

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

See Also

\texttt{roc, tproc.est, proc.est, proc.ci}

Examples

```r
library('pROC')
data(aSAH)
proc(aSAH$outcome, aSAH$s100b, threshold=0.9, method='expect', ci=TRUE, cp=0.95)
```

---

\texttt{proc.ci} \hspace{1cm} \textit{Partial AUC Inference}

Description

Infer the area of region under ROC curve with pre-specific FPR constraint (FPR-pAUC). See Yang et al., 2017 for details.

Usage

```
proc.ci(response, predictor, cp = 0.95, threshold = 0.9, method = "Mw")
```
proc.est

Arguments

response a factor, numeric or character vector of responses; typically encoded with 0 (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its levels are not 0/1, the first level will be defaultly regarded as negative.
predictor a numeric vector of the same length than response, containing the predicted value of each observation. An ordered factor is coerced to a numeric.
cp numeric; coverage probability of confidence interval.
threshold numeric; false positive rate (FPR) constraint.

Details

This function infers FPR partial AUC given response, predictor and pre-specific FPR constraint. mw: Mann-Whitney statistic, method in Yang et al., 2017 adapted from Wang and Chang, 2011. jackknife: jackknife method in Yang et al., 2017.

Value

Confidence interval of FPR partial AUC.

Author(s)

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

See Also
tproc.est, podc.ci

Examples

library('pROC')
data(aSAH)
proc.ci(aSAH$outcome, aSAH$s100b, cp=0.95 ,threshold=0.9,method='expect')

---

proc.est Partial AUC Estimation

Description

Estimate the area of region under ROC curve with pre-specific FPR constraint (FPR-pAUC). See Yang et al., 2017 for details.
**Usage**

```r
proc.est(response, predictor, threshold = 0.9, method = "Mw", smooth = FALSE)
```

**Arguments**

- `response`: a factor, numeric or character vector of responses; typically encoded with 0 (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its levels are not 0 and 1, the first level will be defaultly regarded as negative.
- `predictor`: a numeric vector of the same length than response, containing the predicted value of each observation. An ordered factor is coerced to a numeric.
- `threshold`: numeric; false positive rate (FPR) constraint.
- `smooth`: if TRUE, the ROC curve is passed to `smooth` to be smoothed.

**Details**


**Value**

Estimate of FPR partial AUC.

**Author(s)**

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

**See Also**

`tproc.est, podc.est`

**Examples**

```r
library('pROC')
data(aSAH)
proc.est(aSAH$outcome, aSAH$s100b, method='expect',threshold=0.8)
```
tproc.est

---

**tpAUC**

*Estimation and Inference of Two-Way Partial AUC, FPR partial AUC and FNR partial ODC*

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**Description**

Tools of estimation and inference of two-way partial AUC, FPR partial AUC and FNR partial ODC. Methods are proposed in Yang et al., 2016 and Yang et al., 2017, including Mann-Whitney Statistic, jackknife method, etc.

**Details**

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<td>GPL (&gt;= 2)</td>
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**Author(s)**

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.
Maintainer: Xiang Lyu <lyu17@purdue.edu>

**References**

Yang H, Lu K, Zhao Y. A nonparametric approach for partial areas under ROC curves and ordinal dominance curves. *Statistica Sinica*...

tproc.est

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**Two-Way Partial AUC Estimation**

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**Description**

Estimate the area of region under ROC curve under pre-specific FPR/TPR constraints (two-way partial AUC). See Yang et al., 2016 for details.
Usage

tproc.est(response, predictor, threshold = c(1, 0), smooth = FALSE)

Arguments

response  a factor, numeric or character vector of responses; typically encoded with 0 (negative) and 1 (positive). Only two classes can be used in a ROC curve. If its levels are not 0 and 1, the first level will be defaultly regarded as negative.
predictor  a numeric vector of the same length than response, containing the predicted value of each observation. An ordered factor is coerced to a numeric.
threshold  a length-two numeric vector; the first element is FPR threshold, the second is TPR.
smooth    if TRUE, the ROC curve is passed to smooth to be smoothed.

Details

This function estimates two-way partial AUC given response, predictor and pre-specific FPR/TPR constraints.

Value

Estimate of two-way partial AUC.

Author(s)

Hanfang Yang, Kun Lu, Xiang Lyu, Feifang Hu, Yichuan Zhao.

See Also

roc, podc.est, proc.est

Examples

library('pROC')
data(aSAH)
tproc.est(aSAH$outcome, aSAH$s100b, threshold=c(0.8,0.2))
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