

# 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** <http://arxiv.org/abs/1508.00298>

<http://www3.stat.sinica.edu.tw/statistica/j27n1/j27n117/j27n117.html>

<http://www.ncbi.nlm.nih.gov/pubmed/20729218>

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**NeedsCompilation** no

**Repository** CRAN

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| podc | <i>Partial ODC Estimation and Inference</i> |
|------|---------------------------------------------|

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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

```
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.                                                                                                                                                                                            |
| method    | methods to estimate FNR-pODC. MW: Mann-Whitney statistic. expect: method in (2.2) <a href="#">Wang and Chang, 2011</a> . jackknife: jackknife method in <a href="#">Yang et al., 2017</a> .                                               |
| ci        | logic; compute the confidence interval of estimation?                                                                                                                                                                                     |
| cp        | numeric; coverage probability of confidence interval.                                                                                                                                                                                     |
| smooth    | if TRUE, the ODC curve is passed to <a href="#">smooth</a> to be smoothed.                                                                                                                                                                |

## Details

This function estimates and infers FNR partial ODC given response, predictor and pre-specific FNR constraint. MW: Mann-Whitney statistic. expect: method in [Yang et al., 2017](#) adapted from [Wang and Chang, 2011](#). jackknife: jackknife method in [Yang et al., 2017](#).

## 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**

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

---

podc.ci

*Partial ODC Inference*

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**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**

```
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.                                                                                                                                                                                                |
| method    | methods to estimate partial ODC. MW: Mann-Whitney statistic. expect: method in <a href="#">Yang et al., 2017</a> adapted from <a href="#">Wang and Chang, 2011</a> . jackknife: jackknife method in <a href="#">Yang et al., 2017</a> .       |

**Details**

This function infers FNR partial ODC given response, predictor and pre-specific FNR constraint. MW: Mann-Whitney statistic. expect: method in (2.2) [Wang and Chang, 2011](#). jackknife: jackknife method in [Yang et al., 2017](#).

Value

Confidence interval of FNR partial ODC.

Author(s)

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

See Also

[proc.ci](#)

Examples

```
library('pROC')
data(aSAH)
podc.ci(aSAH$outcome, aSAH$s100b, method='expect', threshold=0.8, cp=0.97)
```

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|          |                               |
|----------|-------------------------------|
| podc.est | <i>Partial ODC Estimation</i> |
|----------|-------------------------------|

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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

```
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.                                                                                                                                                                                                |
| method    | methods to estimate partial ODC. MW: Mann-Whitney statistic. expect: method in <a href="#">Yang et al., 2017</a> adapted from <a href="#">Wang and Chang, 2011</a> . jackknife: jackknife method in <a href="#">Yang et al., 2017</a> .       |
| smooth    | if TRUE, the ODC curve is passed to <a href="#">smooth</a> to be smoothed.                                                                                                                                                                    |

**Details**

This function estimates FNR partial ODC given response, predictor and pre-specific FNR constraint. MW: Mann-Whitney statistic. expect: method in [Yang et al., 2017](#) adapted from [Wang and Chang, 2011](#). jackknife: jackknife method in [Yang et al., 2017](#).

**Value**

Estimation of FNR partial ODC.

**Author(s)**

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

**See Also**

[proc.est](#)

**Examples**

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

---

proc

*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**

```
proc(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 positive rate (FPR) constraint.                                                                                                                                                                                            |

|        |                                                                                                                                                                                             |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| method | methods to estimate FPR-pAUC. MW: Mann-Whitney statistic. expect: method in (2.2) <a href="#">Wang and Chang, 2011</a> . jackknife: jackknife method in <a href="#">Yang et al., 2017</a> . |
| ci     | logic; compute the confidence interval of estimation?                                                                                                                                       |
| cp     | numeric; coverage probability of confidence interval.                                                                                                                                       |
| smooth | if TRUE, the ROC curve is passed to <a href="#">smooth</a> to be smoothed.                                                                                                                  |

## Details

This function estimates and infers FPR partial AUC given response, predictor and pre-specific FPR constraint. MW: Mann-Whitney statistic. expect: method in (2.2) [Wang and Chang, 2011](#). 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

[roc](#), [tproc.est](#), [proc.est](#), [proc.ci](#)

## Examples

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

---

proc.ci

*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")
```

**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.                                                                                                                                                                                            |
| method    | methods to estimate FPR-pAUC. MW: Mann-Whitney statistic. expect: method in (2.2) <a href="#">Wang and Chang, 2011</a> . jackknife: jackknife method in <a href="#">Yang et al., 2017</a> .                                               |

**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

```
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.                                                                                                                                                                                                |
| method    | methods to estimate FPR-pAUC. MW: Mann-Whitney statistic. expect: method in (2.2) <a href="#">Wang and Chang, 2011</a> . jackknife: jackknife method in <a href="#">Yang et al., 2017</a> .                                                   |
| smooth    | if TRUE, the ROC curve is passed to <a href="#">smooth</a> to be smoothed.                                                                                                                                                                    |

## Details

This function estimates FPR partial AUC given response, predictor and pre-specific FPR constraint. MW: Mann-Whitney statistic. expect: method in (2.2) [Wang and Chang, 2011](#). jackknife: jackknife method in [Yang et al., 2017](#).

## 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

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

---

|       |                                                                                             |
|-------|---------------------------------------------------------------------------------------------|
| tpAUC | <i>Estimation and Inference of Two-Way Partial AUC, FPR partial AUC and FNR partial ODC</i> |
|-------|---------------------------------------------------------------------------------------------|

---

## 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

Package: tpAUC  
 Type: Package  
 Date: 2017-04-08  
 License: GPL (>= 2)

## Author(s)

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

## References

Wang Z, Chang Y. Marker selection via maximizing the partial area under the ROC curve of linear risk scores[J]. *Biostatistics*, 2016.  
 Yang H, Lu K, Lyu X, Hu F. Two-Way Partial AUC and Its Properties[J]. *arXiv:1508.00298*, 2016.  
 Yang H, Lu K, Zhao Y. A nonparametric approach for partial areas under ROC curves and ordinal dominance curves. *Statistica*

tproc.est

*Two-Way Partial AUC Estimation***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 <a href="#">smooth</a> 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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