

# Package ‘varoc’

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**Type** Package

**Title** Value Added Receiver Operating Characteristics Curve

**Version** 0.4.0

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**Description**

A continuous version of the receiver operating characteristics (ROC) curve to assess both classification and continuity performances of biomarkers, diagnostic tests, or risk prediction models.

**License** GPL (>= 2)

**Depends** R (>= 4.2.0), pROC, corrplot, grDevices, graphics, stats, utils

**NeedsCompilation** no

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**Repository** CRAN

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**Description**

ROC curve to visualize classification and continuity performances of biomarkers, diagnostic tests, or risk prediction models.

**Usage**

```
varoc(y,x,tmd.range=NULL,legend="right",lwd=3,digits=2)
```

**Arguments**

y	binary outcome, where y=1 if disease (or case) and y=0 if non-disease (or control).
x	continuous score, e.g. biomarker, diagnostic test, risk score.
tmd.range	minimum and maximum values of TMD, displayed on the plot.
legend	legend location, "bottomright", "bottom", "bottomleft", "left", "topleft", "top", "topright", "right" and "center".
lwd	line width.
digits	number of decimals.

**Details**

The varoc function summarizes a continuity performance of x at each cutoff c using two key metrics: (i) tail mean difference (TMD) and (ii) integrated TMD (ITMD). For (i),  $TMD(c)$  is true positive mean (TPM)(c) minus false positive mean (FPM)(c), where  $TPM(c)$  is  $E(x|c_{ly}=1)$  and  $FPM(c)$  is  $E(x|c_{ly}=0)$ . For (ii), ITMD is a global measure of evaluating continuity performance of x over all thresholds.

These measures are continuous versions of ROC curve-based measures. Specifically,  $TPM(c)$  and  $FPM(c)$  are continuous versions of true positive fraction (TPF)(c) and false positive fraction (FPF)(c), where  $TPF(c)=P(x>c_{ly}=1)$  and  $FPF(c)=P(x>c_{ly}=0)$ . Thus, the useful (or useless) x has  $TPF(c)-FPF(c)>0$  and  $TMD(c)>0$  (or  $TPF(c)-FPF(c)=0$  and  $TMD(c)=0$ ); and useful (or useless) x has area under the ROC curve (AUC)>0.5 and  $ITMD(c)>0$  (or AUC=0.5 and  $ITMD(c)=0$ ).

**Value**

th	Threshold values.
tpf	True positive fraction at each threshold.
fpf	False positive fraction at each th.
tpm	True positive mean at each th.
fpm	False positive fraction at each th.
tmd	Tail mean difference, i.e., $tpm-fpm$ , at each th.
auc	Area under the ROC curve.
itmd	Integrated tmd over all thresholds.

**Author(s)**

Yunro Chung [aut, cre]

**References**

Danielle Brister and Yunro Chung, Value added receiver operating characteristics curve (in-progress)

**Examples**

```
set.seed(100)

n1=100
n0=100
y=c(rep(1,n1),rep(0,n0))

#1. useless marker
x1=abs(c(rnorm(n1,0,1),rnorm(n0,0,1)))
fit1=varoc(y=y,x=x1)

#2. useful marker
x2=abs(c(rnorm(n1,2,1),rnorm(n0,0,1)))
fit2=varoc(y=y,x=x2)

#4. markers 1 vs 2
opar=par(mfrow=c(1,2))
tmd.range=range(c(fit1$tmd,fit2$tmd))
fit1=varoc(y=y,x=x1,tmd.range=tmd.range)
fit2=varoc(y=y,x=x2,tmd.range=tmd.range)
on.exit(par(opar))
```

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