

# ROC

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AUC	<i>functionals of ROC curve</i>
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## Description

various functionals of ROC (Receiver Operating Characteristic) curves

## Usage

```
AUC(rocobj)
AUCi(rocobj)
pAUC(rocobj, t0)
pAUCi(rocobj, t0)
```

## Arguments

rocobj	element of class rocc
t0	FPR point at which TPR is evaluated or limit in (0,1) to integrate to

## Details

AUC, pAUC, AUCi and pAUCi compute the Area Under the Curve.  
AUC and pAUC employ the trapezoidal rule. AUCi and pAUCi use integrate().  
AUC and AUCi compute the area under the curve from 0 to 1 on the x-axis (i.e., the 1 - specificity axis).  
pAUC and pAUCi compute the are under the curve from 0 to argument t0 on the x-axis (i.e., the 1 - specificity axis).  
Elements of class rocc can be created by rocdemo.sca() or other constructors you might make using the code of rocdemo.sca() as a template.

**Author(s)**

Vince Carey (stvjc@channing.harvard.edu)

**References**

Rosner, B., 2000, *Fundamentals of Biostatistics, 5th Ed.*, pp. 63–65

Duda, R. O., Hart, P. E., Stork, D. G., 2001 *Pattern Classification, 2nd Ed.*, p. 49

**See Also**

rocdemo.sca

**Examples**

```
set.seed(123)
R1 <- rocdemo.sca( rbinom(40,1,.3), rnorm(40), dxrule.sca,
  caseLabel="new case", markerLabel="demo Marker" )
print(AUC(R1))
print(pAUC(R1,.3))
print(pAUCi(R1,.3))
print(ROC(R1,.3))
```

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plot-methods

*plot method for ROC curves*

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**Description**

plot method for ROC curves

**Methods**

**x = rocc** plots an ROC curve object, with additional parameters available:

**show.thresh (logical):** should marker threshold values be plotted?

**jit (logical):** should plotted points be jittered?

**add (logical):** increment to current plot?

**line (logical):** plot points or lines?

**threshCex (numeric):** if showing threshold values, set character expansion in `text` call to this value

**threshYsh (numeric):** if showing threshold values, add this quantity to y coordinate of curve to plot the threshold value (should be negative for printing below point)

**threshDig (numeric):** if showing threshold values, use this as the `digits` parameter to `round` to display the threshold

... extra parameters passed to `base plot`, `lines` or `points` as needed

**Examples**

```

set.seed(123)
R1 <- rocdemo.sca( rbinom(40,1,.3), rnorm(40), dxrule.sca,
  caseLabel="new case", markerLabel="demo Marker" )
plot(R1, line=TRUE, show.thresh=TRUE, lwd=2, threshDig=2)
R2 <- rocdemo.sca( rbinom(40,1,.3), rnorm(40), dxrule.sca,
  caseLabel="new case", markerLabel="demo Marker" )
plot(R2, line=TRUE, add=TRUE, col="green", lwd=2 )
R3 <- rocdemo.sca( rbinom(40,1,.4), rnorm(40), dxrule.sca,
  caseLabel="new case", markerLabel="demo Marker" )
points(R3, col="red", pch=19)

```

rocc-class

*Class rocc, ROC curve representation***Description**

object representing ROC curve, typically created using rocdemo.sca

**Creating Objects**

```

new('rocc',
sens = ....., # Object of class numeric
spec = ....., # Object of class numeric
rule = ....., # Object of class function
cuts = ....., # Object of class numeric
markerLabel = ....., # Object of class character
caseLabel = ....., # Object of class character
)

```

**Slots**

**sens:** Object of class "numeric" sensitivity values  
**spec:** Object of class "numeric" specificity values  
**rule:** Object of class "function" rule to classify objects  
**cuts:** Object of class "numeric" thresholds defining curve  
**markerLabel:** Object of class "character" name of measured marker  
**caseLabel:** Object of class "character" name of condition

**Methods**

**plot** (rocc, missing): a plotting function with some additional parameters

**Examples**

```

set.seed(123)
R1 <- rocdemo.sca( rbinom(40,1,.3), rnorm(40), dxrule.sca,
  caseLabel="new case", markerLabel="demo Marker" )
plot( R1, show.thresh=TRUE )

```

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rocdemo.sca                    *function to build objects of class 'rocc'*

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### Description

rocdemo.sca – demonstrate 'rocc' class construction using a scalar marker and simple functional rule

### Usage

```
rocdemo.sca(truth, data, rule=NULL,
            cutpts=NA,
            markerLabel="unnamed marker", caseLabel="unnamed diagnosis")
```

### Arguments

truth	true classification of objects. Must take values 0 or 1.
data	quantitative markers used to classify
rule	rule: a function with arguments (x, thresh) returning 0 or 1. If no rule is provided the standard rule <code>dxrule.sca</code> is assumed and a faster implementation utilized.
cutpts	values of thresholds
markerLabel	textual label describing marker
caseLabel	textual label describing classification

### Details

`dxrule.sca` is function (x, thresh) `ifelse(x > thresh, 1, 0)`

The default value of argument `cutpts` is a point less than `min(data)`, points separating the unique values of data and a point greater than `max(data)`.

### Value

an object of S4 class `rocc`

### Author(s)

Vince Carey ([stvjc@channing.harvard.edu](mailto:stvjc@channing.harvard.edu))

### See Also

AUC

**Examples**

```
set.seed(123)
R1 <- rocdemo.sca( rbinom(40,1,.3), rnorm(40), caseLabel="new case", markerLabel="demo Ma
plot(R1, line=TRUE, show.thresh=TRUE)

truth <- c(0, 1, 0, 1, 1, 0, 1, 1)
data <- c(2, 3, 4, 4, 5, 6, 7, 8)
R2 <- rocdemo.sca(truth, data, dxrule.sca)
plot(R2, line=TRUE, show.thresh=TRUE)
R3 <- rocdemo.sca(truth, data, function(x, thresh) 1 - dxrule.sca(x, thresh))
if (AUC(R2) + AUC(R3) != 1) stop('Sum of AUCs should be 1.')
```

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trapezint

*trapezoidal rule for AUC*

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**Description**

trapezoidal rule for AUC

**Usage**

```
trapezint(x, y, a, b)
```

**Arguments**

x	x - abscissae
y	y - ordinates
a	a - lower limit of integration
b	b - upper limit of integration

**Details**

uses approx

**Value**

estimated AUC

**Examples**

```
x <- sort(runif(30))
y <- sin(x)
print(trapezint(x, y, 0, 1))
```

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