# Package 'TOC'

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**Type** Package

**Title** Total Operating Characteristic (TOC) Curve

**Version** 0.0-1

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**Depends** R (>= 2.14.0), raster, bit, rgdal, methods

**Description** Construction of the Total Operating Characteristic (TOC) Curve and the Receiver (aka Relative) Operating Characteristic (ROC) Curve for spatial data.

**License** GPL (>= 2)

**Encoding** latin1

## R topics documented:



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`TOC-package` *Total Operating Characteristic (TOC) Curve*

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### Description

Construction of the Total Operating Characteristic (TOC) Curve and the Receiver (aka Relative) Operating Characteristic (ROC) Curve for spatial data.

## Details

| | |
|---|---|
| Package: | TOC |
| Type: | Package |
| Version: | 0.0-1 |
| Date: | 2015-03-28 |
| License: | GPL (>= 2) |
| LazyLoad: | yes |

## Author(s)

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## See Also

TOC, plot

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# plot *Plot an object of class Toc or Roc*

---

## Description

Plot a Total Operating Characteristic (TOC) curve or a Relative Operating Characteristic (ROC)

## Usage

```
## S4 method for signature 'Toc'
plot(x, labelThres=FALSE, digits=3, modelLeg="Model", ...)


## S4 method for signature 'Roc'
plot(x, labelThres=FALSE, digits=3, modelLeg="Model", ...)
```

## Arguments

| | |
|---|---|
| x | An object of class Toc or Roc |
| labelThres | logical, default to FALSE. If TRUE, thresholds are labeled in the TOC plot |
| digits | integer indicating the number of decimal places (round) or significant digits (signif) to be used for labeling the thresholds and the numeric axes. Negative values are allowed. See Details in the round function |
| modelLeg | a character string for labeling the model in the legend |
| ... | additional parameters to be passed to plot |

## Value

a plot showing the TOC or the ROC curves

## See Also

TOC, ROC

## Examples

```
## Not run:
index <- raster("p_built01_suitability_1.rst")
boolean <- raster("BuiltGain1985_1999.rst")
mask <- raster("1985NonBuilt01.rst")
tocd <- TOC(index, boolean, mask)
plot(tocd, main="TOC curve")
rocd <- ROC(index, boolean, mask)
plot(rocd, main="ROC curve")

## End(Not run)
## Not run:
index <- raster("Prob_Map2.rst")
boolean <- raster("Change_Map2b.rst")
mask <- raster("MASK3.rst")
tocd <- TOC(index, boolean, mask, nthres=100)
plot(tocd, main="TOC curve")
rocd <- ROC(index, boolean, mask, nthres=100)
plot(rocd, main="ROC curve")

## End(Not run)
```

---

# ROC *Construct the table for the ROC curve*

---

## Description

Construct the table for the Relative Operating Characteristic (ROC) curve

## Usage

```
ROC(index, boolean, mask=NULL, nthres=NULL, thres=NULL, NAval=0, P=NA, Q=NA,
progress=FALSE)
```

## Arguments

| | |
|---|---|
| index | index Raster map |
| boolean | boolean Raster map |
| mask | mask Raster map |
| nthres | an optional integer indicating the number of equal-interval thresholds to be evaluated for the ROC curve. See Details below |
| thres | an optional numeric vector of thresholds to be evaluated for the ROC curve. See Details below |

| | |
|---|---|
| NAval | value for nodata (NA values) in the mask map |
| P | count of reference presence observations in the population |
| Q | count of reference absence observations in the population |
| progress | logical; if TRUE, a progress bar is shown |

## Details

thresholds are calculated as the unique values of the index map after masking out NA values (default option), if neither nthres nor thres is provided. The default option can be time-consuming if the amount of unique values in the index map (after masking out NA values) is large (e.g., > 1000). In the latter case, the user may prefer to enter specified thresholds (with the thres argument), or to indicate the number of equal-interval thresholds to be evaluated for the ROC curve (with the nthres argument)

## Value

an object of class Roc containing the ROC table, the area under the curve (AUC), maximum AUC and minimum AUC

## See Also

plot

## Examples

```
## Not run:
index <- raster("p_built01_suitability_1.rst")
boolean <- raster("BuiltGain1985_1999.rst")
mask <- raster("1985NonBuilt01.rst")

# all unique values of the index map after applying the mask are used as thresholds (default
# option)
rocd <- ROC(index, boolean, mask)
rocd


# thresholds can also be defined by indicating the number of equal-interval thresholds
rocd <- ROC(index, boolean, mask, nthres=10)
rocd

# A vector of thresholds can be used to define the thresholds
rocd <- ROC(index, boolean, mask, thres=seq(0, 100, by=10))
rocd

## End(Not run)
## Not run:
index <- raster("Prob_Map2.rst")
boolean <- raster("Change_Map2b.rst")
mask <- raster("MASK3.rst")

# thresholds can also be defined by indicating the number of equal-interval thresholds
rocd <- ROC(index, boolean, mask, nthres=100)
rocd

# A vector of thresholds can be used to define the thresholds
```

```
rocd <- ROC(index, boolean, mask, thres=seq(0, 100, by=10))
rocd

## End(Not run)
```

---

`scaling` *scale the output TOC values and change units*

---

## Description

scale the 'Hits' and 'Hits+FalseAlarms' values in the TOC output table, as well as the prevalence and population, using a scaling factor. Labels for the modified units in the TOC object are changed to `newUnits`

## Usage

```
## S4 method for signature 'Toc'
scaling(x, scalingFactor, newUnits)
```

## Arguments

| | |
|---|---|
| `x` | an object of class Toc |
| `scalingFactor` | numeric value to scale 'Hits' and 'Hits+FalseAlarms' values in the TOC output table, as well as the prevalence and population |
| `newUnits` | charater string for the new data units in the TOC object |

## Value

an object of class TOC

## See Also

`TOC`, `ROC`

## Examples

```
## Not run:
index <- raster("p_built01_suitability_1.rst")
boolean <- raster("BuiltGain1985_1999.rst")
mask <- raster("1985NonBuilt01.rst")
tocd <- TOC(index, boolean, mask)
plot(tocd)

# scale units from square m to square km
tocd_sqkm <- scaling(tocd, scalingFactor=1000000, newUnits="square km")
plot(tocd_sqkm)

## End(Not run)
## Not run:
index <- raster("Prob_Map2.rst")
boolean <- raster("Change_Map2b.rst")
```

```
mask <- raster("MASK3.rst")
tocd <- TOC(index, boolean, mask, nthres=100)
plot(tocd)

# scale units from square m to square km
tocd_sqkm <- scaling(tocd, scalingFactor=1000000, newUnits="square km")
plot(tocd_sqkm)

## End(Not run)
```

---

TOC *Construct the table for the TOC curve*

---

## Description

Construct the table for the Total Operating Characteristic (TOC) curve

## Usage

```
TOC(index, boolean, mask=NULL, nthres=NULL, thres=NULL, NAval=0, P=NA, Q=NA,
progress=FALSE)
```

## Arguments

| | |
|---|---|
| index | index Raster map |
| boolean | boolean Raster map |
| mask | mask Raster map |
| nthres | an optional integer indicating the number of equal-interval thresholds to be evaluated for the TOC curve. See Details below |
| thres | an optional numeric vector of thresholds to be evaluated for the TOC curve. See Details below |
| NAval | value for nodata (NA values) in the mask map |
| P | count of reference presence observations in the population |
| Q | count of reference absence observations in the population |
| progress | logical; if TRUE, a progress bar is shown |

## Details

thresholds are calculated as the unique values of the index map after masking out NA values (default option), if neither nthres nor thres is provided. The default option can be time-consuming if the amount of unique values in the index map (after masking out NA values) is large (e.g., > 1000). In the latter case, the user may prefer to enter specified thresholds (with the thres argument), or to indicate the number of equal-interval thresholds to be evaluated for the TOC curve (with the nthres argument)

## Value

an object of class Toc containing the TOC table, the area under the curve (AUC), maximum AUC and minimum AUC, the prevalence, the population and the data units (for data in the TOC table, prevalence and population)

## See Also

plot

## Examples

```
## Not run:
index <- raster("p_built01_suitability_1.rst")
boolean <- raster("BuiltGain1985_1999.rst")
mask <- raster("1985NonBuilt01.rst")

# all unique values of the index map after applying the mask are used as thresholds (default
# option)
tocd <- TOC(index, boolean, mask)
tocd

# thresholds can also be defined by indicating the number of equal-interval thresholds
tocd <- TOC(index, boolean, mask, nthres=10)
tocd

# A vector of thresholds can be used to define the thresholds
tocd <- TOC(index, boolean, mask, thres=seq(0, 100, by=10))
tocd

## End(Not run)
## Not run:
index <- raster("Prob_Map2.rst")
boolean <- raster("Change_Map2b.rst")
mask <- raster("MASK3.rst")

# thresholds can also be defined by indicating the number of equal-interval thresholds
tocd <- TOC(index, boolean, mask, nthres=100)
tocd

# A vector of thresholds can be used to define the thresholds
tocd <- TOC(index, boolean, mask, thres=seq(0, 100, by=10))
tocd

## End(Not run)
```

---

# Toc-class *Toc and Roc classes*

---

## Description

Toc and Roc classes

## Objects from the Class

Objects can be created by calls of the form `new("Toc", ...)`, or with the helper functions such as `Toc`.

## Slots

Slots for Roc and Toc objects

`table`: data.frame

`AUC`: numeric; Area Under the Curve

`maxAUC`: numeric; maximum AUC

`minAUC`: numeric; minimum AUC

`prevalence`: numeric; prevalence

`population`: numeric; population

`units`: character; units for data in the TOC table, prevalence and population

## Examples

```
showClass("Toc")
```

---

`Toc-methods` *Methods for the Roc and Toc classes*

---

## Description

Methods for the Roc and Toc classes

## Details

Methods for the Roc and Toc classes

## Value

an object of class Toc or Roc

## See Also

`TOC`, `ROC`

# Index