Package ‘predtools’

Title Prediction Model Tools
Version 0.0.2
License GPL
Encoding UTF-8
LazyData true
RoxygenNote 7.1.2
URL https://github.com/resplab/predtools
BugReports https://github.com/resplab/predtools/issues
Depends R (>= 3.6)
Imports Rcpp, pROC, stats, graphics, RConics, ggplot2, dplyr, magrittr
LinkingTo Rcpp
Suggests rmarkdown, knitr
VignetteBuilder knitr
NeedsCompilation yes
Author Mohsen Sadatsafavi [aut, cph] (<https://orcid.org/0000-0002-0419-7862>),
  Amin Adibi [cre] (<https://orcid.org/0000-0003-2748-4781>),
  Abdollah Safari [aut]
Maintainer Amin Adibi <adibi@alumni.ubc.ca>
Repository CRAN
Date/Publication 2021-10-05 08:10:05 UTC

R topics documented:
calc_mROC_stats ................................................. 2
calibration_plot ................................................ 2
dev_data .......................................................... 4
calc_mROC_stats  

Calculates the absolute surface between the empirical and expected ROCs

**Description**

Calculates the absolute surface between the empirical and expected ROCs

**Usage**

```R
calc_mROC_stats(y, p, ordered = FALSE, fast = TRUE)
```

**Arguments**

- `y`: y vector of binary responses
- `p`: p vector of predicted probabilities (same length as y)
- `ordered`: defaults to false
- `fast`: defaults to true

**Value**

Returns a list with the A (mean calibration statistic) and B (mROC/ROC equality statistic) as well as the direction of potential miscalibration (sign of the difference between the actual and predicted mean risk)

---

calibration_plot  

Title Create calibration plot based on observed and predicted outcomes.

**Description**

Title Create calibration plot based on observed and predicted outcomes.
Usage

calibration_plot(
    data,
    obs,
    follow_up = NULL,
    pred,
    group = NULL,
    nTiles = 10,
    legendPosition = "right",
    title = NULL,
    x_lim = NULL,
    y_lim = NULL,
    xlab = "Prediction",
    ylab = "Observation",
    points_col_list = NULL,
    data_summary = FALSE
)

Arguments

data   Data include observed and predicted outcomes.
obs    Name of observed outcome in the input data.
follow_up Name of follow-up time (if applicable) in the input data.
pred   Name of first predicted outcome in the input data.
group  Name of grouping column (if applicable) in the input data.
nTiles Number of tiles (e.g., 10 for deciles) in the calibration plot.
legendPosition Legend position on the calibration plot.
title  Title on the calibration plot.
x_lim  Limits of x-axis on the calibration plot.
y_lim  Limits of y-axis on the calibration plot.
xlab   Label of x-axis on the calibration plot.
ylab   Label of y-axis on the calibration plot.
points_col_list Points’ color on the calibration plot.
data_summary Logical indicates whether a summary of the predicted and observed outcomes.

Value

Returns calibration plot (a ggplot object) and a dataset including summary statistics of the predicted and observed outcomes (if data_summary set to be TRUE).
Examples

```r
library(predtools)
library(dplyr)
x <- rnorm(100, 10, 2)
y <- x + rnorm(100, 0, 1)
data <- data.frame(x, y)
calibration_plot(data, obs = "x", pred = "y")
```

---

dev_data  
\textit{model development data}

Description

A dataset containing sample model development data

Format

A data frame with 500 rows and 5 variables:

- age
- severity
- sex
- comorbidity
- y

Source

Simulated

---

mAUC

\textit{Takes in a mROC object and calculates the area under the curve}

Description

Takes in a mROC object and calculates the area under the curve

Usage

```r
mAUC(mROC_obj)
```

Arguments

- `mROC_obj`  
  An object of class mROC

Value

Returns the area under the mROC curve
mROC

Calculates mROC from the vector of predicted risks. Takes in a vector of probabilities and returns mROC values (True positives, False Positives in an object of class mROC).

### Description

Calculates mROC from the vector of predicted risks. Takes in a vector of probabilities and returns mROC values (True positives, False Positives in an object of class mROC).

### Usage

mROC(p, ordered = FALSE)

### Arguments

- **p**: A numeric vector of probabilities.
- **ordered**: Optional, if the vector p is ordered from small to large (if not the function will do it; TRUE is to facilitate fast computations).

### Value

This function returns an object of class mROC. It has three vectors: thresholds on predicted risks (which is the ordered vector of input probabilities), false positive rates (FPs), and true positive rates (TPs). You can directly call the plot function on this object to draw the mROC.

---

mROC_analysis

Main eROC analysis that plots ROC and eROC.

### Description

Main eROC analysis that plots ROC and eROC.

### Usage

mROC_analysis(y, p, inference = 0, n_sim, fast = TRUE)

### Arguments

- **y**: y vector of observed responses.
- **p**: p vector of predicted probabilities (the same length as observed responses).
- **inference**: 0 for no inference, 1 for p-value only, and 2 for p-value and 95 percent CI.
- **n_sim**: number of simulations.
- **fast**: defaults to true.
Value
returns a list containing the results of mROC analysis.

---

**mROC_inference**
Statistical inference for comparing empirical and expected ROCs. If CI=TRUE then also returns pointwise CIs

**Description**
Statistical inference for comparing empirical and expected ROCs. If CI=TRUE then also returns pointwise CIs

**Usage**
mROC_inference(y, p, n_sim = 1e+05, CI = FALSE, aux = FALSE, fast = TRUE)

**Arguments**
- **y** vector of binary response values
- **p** vector of probabilities
- **n_sim** number of Monte Carlo simulations to calculate p-value
- **CI** optional. Whether confidence interval should be calculated for each point of mROC. Default is FALSE.
- **aux** aux optional. Whether additional results (component-wise p-values etc) should be written in the package’s aux variable. Default is FALSE.
- **fast** fast optional. Whether the fast code (C++) or slow code (R) should be called. Default is TRUE (R code will be slow unless the dataset is small)

**Value**
Returns an object of type mROC_inference containing the results of statistical inference for the mROC curve

---

**odds_adjust**
Title Update a prediction model for a binary outcome by multiplying a fixed odd-ratio to the predicted odds.

**Description**
Title Update a prediction model for a binary outcome by multiplying a fixed odd-ratio to the predicted odds.
pred_summary_stat

Usage

odds_adjust(p0, p1, v)

Arguments

p0  Mean of observed risk or predicted risk in development sample.
p1  Mean of observed risk in target population.
v  Variance of predicted risk in development sample.

Value

Returns a correction factor that can be applied to the predicted odds in order to update the predictions for a new target population.

---

pred_summary_stat  Title Estimate mean and variance of prediction based on model calibration output.

Description

Title Estimate mean and variance of prediction based on model calibration output.

Usage

pred_summary_stat(calibVector)

Arguments

calibVector  Vector of predicted probability of risk per decile or percentile (e.g., from a calibration plot).

Value

Returns mean and variance of predictions based on the predicted probabilities.
val_data

model validation data

Description

A dataset containing sample model validation data

Format

A data frame with 400 rows and 5 variables:

- age
- severity
- sex
- comorbidity
- y

Source

Simulated
Index

* datasets
  dev_data, 4
  val_data, 8

calc_mROC_stats, 2
calibration_plot, 2

dev_data, 4
mAUC, 4
mROC, 5
mROC_analysis, 5
mROC_inference, 6

odds_adjust, 6
pred_summary_stat, 7

val_data, 8