Package ‘survivalROC’

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Title Time-dependent ROC curve estimation from censored survival data

Author Patrick J. Heagerty <heagerty@u.washington.edu>, packaging by Paramita Saha-Chaudhuri <paramita.sahachaudhuri.work@gmail.com>

Maintainer Paramita Saha-Chaudhuri

<paramita.sahachaudhuri.work@gmail.com>

Depends R (>= 1.6.1)

Description Compute time-dependent ROC curve from censored survival data using Kaplan-Meier (KM) or Nearest Neighbor Estimation (NNE) method of Heagerty, Lumley & Pepe (Biometrics, Vol 56 No 2, 2000, PP 337-344)

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R topics documented:

mayo ......................................................... 2

survivalROC .............................................. 2

survivalROC.C .......................................... 4

Index 6
**Mayo Marker data**

**Description**

Two marker values with event time and censoring status for the subjects in Mayo PBC data

**Format**

A data frame with 312 observations and 4 variables: time (event time/censoring time), censor (censoring indicator), mayoscore4, mayoscore5. The two scores are derived from 4 and 5 covariates respectively.

**Author(s)**

Patrick J. Heagerty

**References**


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**Time-dependent ROC curve estimation from censored survival data**

**Description**

This function creates time-dependent ROC curve from censored survival data using the Kaplan-Meier (KM) or Nearest Neighbor Estimation (NNE) method of Heagerty, Lumley and Pepe, 2000

**Usage**

```
survivalROC(stime, status, marker, entry = NULL, predict.time, cut.values = NULL, method = "NNE", lambda = NULL, span = NULL, window = "symmetric")
```

**Arguments**

- `stime`: Event time or censoring time for subjects
- `status`: Indicator of status, 1 if death or event, 0 otherwise
- `marker`: Predictor or marker value
- `entry`: Entry time for the subjects
- `predict.time`: Time point of the ROC curve
- `cut.values`: Marker values to use as a cut-off for calculation of sensitivity and specificity
Method for fitting joint distribution of (marker, t), either of KM or NNE, the default method is NNE

lambda smoothing parameter for NNE

span Span for the NNE, need either lambda or span for NNE

window window for NNE, either of symmetric or asymmetric

Details

Suppose we have censored survival data along with a baseline marker value and we want to see how well the marker predicts the survival time for the subjects in the dataset. In particular, suppose we have survival times in days and we want to see how well the marker predicts the one-year survival (predict.time = 365 days). This function roc.KM.calc(), returns the unique marker values, TP (True Positive), FP (False Positive), Kaplan-Meier survival estimate corresponding to the time point of interest (predict.time) and AUC (Area Under (ROC) Curve) at the time point of interest.

Value

Returns a list of the following items:

cut.values unique marker values for calculation of TP and FP

TP True Positive corresponding to the cut offs in marker

FP False Positive corresponding to the cut offs in marker

predict.time time point of interest

Survival Kaplan-Meier survival estimate at predict.time

AUC Area Under (ROC) Curve at time predict.time

Author(s)

Patrick J. Heagerty

References


Examples

data(mayo)
nobs <- NROW(mayo)
cutoff <- 365
  ## MAYOSCORE 4, METHOD = NNE
Mayo4.1 <- survivalROC(stime=mayo$time,
            status=mayo$censor,
            marker = mayo$mayoscore4,
            predict.time = cutoff,span = 0.25*nobs^(-0.20) )
plot(Mayo4.1$FP, Mayo4.1$TP, type="l", xlab="time", ylab="AUC = ",
xlab=paste("FP", "\n", "AUC = ",round(Mayo4.1$AUC,3)),
ylab="TP",main="Mayoscore 4, Method = NNE \n Year = 1")
survivalrocC

## MAYOSCORE 4, METHOD = KM
Mayo4.2= survivalROC(stime=mayo$time, status=mayo$censor, marker=mayo$mayoscore4, predict.time = cutoff, method="KM")
plot(Mayo4.2$FP, Mayo4.2$TP, type="l", xlim=c(0,1), ylim=c(0,1), xlab=paste("FP", "\n", "AUC = ",round(Mayo4.2$AUC,3)), ylab="TP",main="Mayoscore 4, Method = KM \ n Year = 1")
abline(0,1)

### survivalrocC

**Time-dependent ROC curve estimation from censored survival data**

**Description**

This function creates time-dependent ROC curve from censored survival data using the Nearest Neighbor Estimation (NNE) method of Heagerty, Lumley and Pepe, 2000.

**Usage**

survivalrocC(stime,status,marker,predict.time,span)

**Arguments**

- **stime**: Event time or censoring time for subjects
- **status**: Indicator of status, 1 if death or event, 0 otherwise
- **marker**: Predictor or marker value
- **predict.time**: Time point of the ROC curve
- **span**: Span for the NNE

**Details**

Suppose we have censored survival data along with a baseline marker value and we want to see how well the marker predicts the survival time for the subjects in the dataset. In particular, suppose we have survival times in days and we want to see how well the marker predicts the one-year survival (PredictTime=365 days). This function returns the unique marker values, sensitivity (True positive or TP), (1-specificity) (False positive or FP) and Kaplan-Meier survival estimate corresponding to the time point of interest (PredictTime). The (FP,TP) values then can be used to construct ROC curve at the time point of interest.
**Value**

Returns a list of the following items:

- `cut.values`: unique marker values for calculation of TP and FP
- `TP`: TP corresponding to the cut off in marker
- `FP`: FP corresponding to the cut off in marker
- `predict.time`: time point of interest
- `Survival`: Kaplan-Meier survival estimate at predict.time
- `AUC`: Area Under (ROC) Curve at time predict.time

**Author(s)**

Patrick J. Heagerty

**References**


**Examples**

data(mayo)

nobs <- NROW(mayo)
cutoff <- 365
Staltscore4 <- NULL
Mayo.fit4 <- survivalROC.C(  Stime = mayo$time,
                               status = mayo$censor,
                               marker = mayo$mayoscore4,
                               predict.time = cutoff,
                               span = 0.25*nobs^(-0.20))
Staltscore4 <- Mayo.fit4$Survival
plot(Mayo.fit4$FP, Mayo.fit4$TP, type = "l",
     xlim = c(0,1), ylim = c(0,1),
     xlab = paste("FP \n AUC =",round(Mayo.fit4$AUC,3)),
     ylab = "TP",main = "Year = 1")
abline(0,1)
Index

*Topic *survival
  mayo, 2
  survivalROC, 2
  survivalROC.C, 4

mayo, 2

survivalROC, 2
survivalROC.C, 4