Package 'survivalROC'

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Title Time-Dependent ROC Curve Estimation from Censored Survival Data

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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 *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

Heagerty, P.J., Zheng, Y. (2005) Survival Model Predictive Accuracy and ROC Curves *Biometrics*, **61**, 92 – 105

survivalROC *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	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

Heagerty, P.J., Lumley, T., Pepe, M. S. (2000) Time-dependent ROC Curves for Censored Survival Data and a Diagnostic Marker *Biometrics*, **56**, 337 – 344

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$TP, type="l", xlim=c(0,1), ylim=c(0,1),
  xlab=paste( "FP", "\n", "AUC = ",round(Mayo4.1$AUC,3)),
  ylab="TP",main="Mayoscore 4, Method = NNE \n  Year = 1")
```

```
abline(0,1)

## 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)
```

`survivalROC.C` *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

```
survivalROC.C(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

Heagerty, P.J., Lumley, T., Pepe, M. S. (2000) Time-dependent ROC Curves for Censored Survival Data and a Diagnostic Marker *Biometrics*, **56**, 337 – 344

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