Package ‘crrstep’

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Type Package

Title Stepwise Covariate Selection for the Fine & Gray Competing Risks Regression Model

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Author Ravi Varadhan & Deborah Kuk

Maintainer Ravi Varadhan <ravi.varadhan@jhu.edu>

Description
Performs forward and backwards stepwise regression for the Proportional subdistribution hazards model in competing risks (Fine & Gray 1999). Procedure uses AIC, BIC and BICcr as selection criteria. BICcr has a penalty of k = log(n*), where n* is the number of primary events.

Depends cmprsk

License GPL (>= 2)

LazyLoad yes

NeedsCompilation no

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crrstep-package *Stepwise regression procedure for the Fine & Gray regression model in competing risks*

Description

Performs forward and backward stepwise regression for the Fine & Gray regression model in competing risks. Procedure uses AIC, BIC and BICcr as selection criteria. BICcr has a penalty of k = log(n*), where n* is the number of Type I events.

Details

Package:	crrstep
Type:	Package
Version:	2014-07.16
Date:	2014-07.16
License:	GPL (version 2)
LazyLoad:	yes

The package contains a singe function `crrstep`, which implements backward and forward stepwise regression for the Fine & Gray regression model. The Fine & Gray model (Fine & Gray, 1999) estimates the hazard that corresponds to the cumulative incidence function of a certain event type. Selection criteria that are can be used are: AIC, BIC and BICcr. BICcr is a selection criteria based on the work by Volinksy and Raftery in which the penalty is k = log(n*), where n* is the total number of Type I events.

Author(s)

Ravi Varadhan & Deborah Kuk.

Maintainers: Ravi Varadhan <rvaradhan@jhmi.edu>

References

Fine, J. P. and Gray, R. J. (1999). A proportional hazards model for the subdistribution of a competing risk. *Journal of the American Statistical Association*.

Volinsky, C. T. and Raftery, A. E. (2000). Bayesian information criterion for censored survival models. *Biometrics*.

Kuk, D. and Varadhan, R. (2013). Model selection in competing risks regression. *Statistics in Medicine*.

Examples

```
set.seed(123)
n <- 500
ftime <- rexp(n)
```

```
fstatus <- sample(0:2,n,replace=TRUE)
cov1 <- matrix(runif(5*n),nrow=n)
x61 <- as.factor(sample(3, size=n, rep=TRUE))
x71 <- as.factor(sample(5, size=n, rep = TRUE))
cov1 <- cbind(cov1, x61, x71)
dimnames(cov1)[[2]] <- c('x1','x2','x3','x4','x5', 'x6', 'x7')
formula1 <- ftime ~ 1 + x1 + x2 + x3 + x4 + x5 + as.factor(x6) + as.factor(x7)

crrstep(formula1, , fstatus, data = as.data.frame(cov1), direction = "backward", criterion = "BIC")
crrstep(formula1, , fstatus, data = as.data.frame(cov1), direction = "backward", criterion = "AIC")

ans2 <- crrstep(formula1, , fstatus, data = as.data.frame(cov1), direction = "forward",
failcode=2, criterion = "AIC")
ans2
```

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crrstep *Stepwise regression for competing risks regression*

Description

Performs forward and backward stepwise regression for the Fine & Gray regression model in competing risks. Procedure uses AIC, BIC and BICcr as selection criteria. BICcr has a penalty of k = log(n*), where n* is the number of Type I events.

Usage

```
crrstep(formula, scope.min = ~1, etype, ..., subset,
data, direction = c("backward", "forward"),
criterion = c("AIC", "BICcr", "BIC"), crr.object = FALSE,
trace = TRUE, steps = 100)
```

Arguments

`formula`	formula object where LHS is failure time and RHS is linear predictors; intercept '1' should always be included.
`scope.min`	formula object denoting final model for backward selection and starting model for forward selection.
`etype`	integer variable that denotes type of failure for each person.
`...`	variables passed to 'crr' function; two key variables are *failcode* and *cencode*; see below in `Description`.
`subset`	subset of data to be used for model selection.
`data`	data-frame containing all the variables. Only complete cases are used in the analysis, i.e. rows of dataframe with missing values in any of the predictors are deleted.
`direction`	forward or backward direction for model selection.

criterion	selection criterion; default is AIC. BIC uses log(n) as penalty, where 'n' is total sample size, and BICcr uses log(n*) as the penalty where n* is the number of primary events.
crr.object	logical variable indicating whether to return final 'crr' object.
trace	logical indicating whether to display stepwise model selection process.
steps	maximum number of steps in stepwise selection.

Details

Based on the existing code of stepAIC in the MASS package. Variables passed to 'crr' function include two key variables: *failcode* and *cencode*. *failcode* is an integer value that denotes primary failure, and *cencode* is an integer denoting censoring event.

Value

variables	Variables in the final model
coefficients	The estimated coefficients of the variables
std.errors	Standard errors of the estimated coefficients
log.lik	The partial log-likelihood of the model

Author(s)

Ravi Varadhan & Deborah Kuk.

References

Fine, J. P. and Gray, R. J. (1999). A proportional hazards model for the subdistribution of a competing risk. Journal of the American Statistical Association.

Volinsky, C. T. and Raftery, A. E. (2000). Bayesian information criterion for censored survival models. Biometrics.

Kuk, D. and Varadhan, R. (2013). Model selection in competing risks regression. *Statistics in Medicine*.

See Also

crr

Examples

```
set.seed(123)
n <- 500
ftime <- rexp(n)
fstatus <- sample(0:2,n,replace=TRUE)
cov1 <- matrix(runif(5*n),nrow=n)
x61 <- as.factor(sample(3, size=n, rep=TRUE))
x71 <- as.factor(sample(5, size=n, rep = TRUE))
cov1 <- cbind(cov1, x61, x71)
dimnames(cov1)[[2]] <- c('x1','x2','x3','x4','x5', 'x6', 'x7')
```

```
formula1 <- ftime ~ x1 + x2 + x3 + x4 + x5 + as.factor(x6) + as.factor(x7)

crrstep(formula1, , fstatus, data = as.data.frame(cov1), direction = "backward", criterion = "BIC")

ans2 <- crrstep(formula1, , fstatus, data = as.data.frame(cov1), direction = "forward",
failcode=2, criterion = "AIC")
ans2
```

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