Package ‘NPMLEcmprsk’

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Type Package

Title Type-Specific Failure Rate and Hazard Rate on Competing Risks Data

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Description Given a failure type, the function computes covariate-specific probability of failure over time and covariate-specific conditional hazard rate based on possibly right-censored competing risk data. Specifically, it computes the non-parametric maximum-likelihood estimates of these quantities and their asymptotic variances in a semi-parametric mixture model for competing-risks data, as described in Chang et al. (2007a).

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Description

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Usage

```
NPMLEcmprsk(DATA,censoring.coding=0,alpha.stable.parameter=100,
beta.stable.parameter=100,initial.alpha=0,initial.beta=0,
threshold=0,iteration=5000)
```

Arguments

`DATA` An N-by-P matrix of data. Each of the N rows in the data matrix stores the data for one subject. Each of the P columns stores one variable. The first column stores the observation time, which is the minimum of time-to-failure and censoring time of a subject; the second column stores the observation time status, which indicates whether the observation time is a censoring time or not and the failure type of the subject when it is not a censoring time and is coded by an non-negative number for each observable time. The remaining columns store P-2 covariate values. The censoring status is coded zero.

`censoring.coding` The code represents the censoring status. Default value is zero.

`alpha.stable.parameter`, `beta.stable.parameter` These parameters influence the convergence rate of the algorithm. More specifically, the parameter determines the difference between the approximations of estimator in the algorithm; from the proposition in Chang, et al. (2007a), the smaller parameter suggests the larger range between the approximations of estimator. In our experiments, more covariates and more failure types usually have to provide larger stable parameter for the convergence. Default value is 100.

`initial.alpha`, `initial.beta` The initial values of iterations in the algorithm. Default value is zero.

`threshold` The threshold for convergence in the algorithm. Default value is zero.

`iteration` The number of iterations in the algorithm. Default value is 5,000.

Details

This function fits the semi-parametric mixture model for competing-risks data, in which proportional hazards models allowing covariates are specified for failure time models conditional on failure type and a multinomial model is specified for marginal distribution of failure type conditional on covariates, described in Chang et al. (2007a). This is a flexible model for competing risk data; in particular, it does not require the independence between covariates and censoring time. The algorithm is efficient for the computation of the non-parametric maximum likelihood estimates; it is also discussed in Chang et al. (2007b).

Value

Returns a list with components

`alpha` The coefficient on the probability of type-specific failures, defined by a logistic model, and it's a (P-1)-by-(K-1) matrix, where K denote the number of failure types.

`alpha.se`, `alpha.pvalue`
The standard error and p-value for alpha respectively.

`alpha.95.lower.CI`, `alpha.95.upper.CI`
The 95% confidence interval for alpha.

`beta` The relative risk coefficients in the hazard function for each type-specific time-to-failure and it's a (P-2)-by-K matrix.

`beta.se`, `beta.pvalue`
The standard error and p-value for beta respectively.

`beta.95.lower.CI`, `beta.95.upper.CI`
The 95% confidence interval for beta.

`Lambda` The cumulative baseline hazards.

We will demonstrate a simulation study in the Examples section, in which included the plot of the probability of type-specific failures.

Note

The missing value (e.g. NA) in the DATA is not allowed in this version.

Author(s)

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References

Chang, I. S. et al. (2007a) A fast algorithm for the nonparameteric maximum likelihood estimate in the Cox-gene model. Statist. Sinica 17, 841-856.
Chang, I. S. et al. (2007b) Non-parametric maximum-likelihood estimation in a semiparametric mixture model for competing-risks data. Scand. J. Statist. 34, 870-895.

See Also

none

Examples

```
## Not run:
# setting the seed
set.seed(1)

# setting the sample size
N<-500

# setting the real parameters
alpha<-c(-2,5)
beta<-c(0.5,-0.5)
Lambda<-1/c(4,5)
Z<-rnorm(N,0,1)

# generating the data
W<-c((exp(cbind(1,Z)
T<--log(matrix(runif(2*N),2,N))/Lambda*exp(-t(cbind(Z,Z))*beta)
survival.time<-sapply(1:N,function(i) T[W[i],i])

censoring.time<-runif(N,0.1,10)

temp<-survival.time<=censoring.time
X<-sapply(1:N,function(i) if(temp[i]) survival.time[i] else censoring.time[i])
delta<-sapply(1:N,function(i) if(temp[i]) W[i] else 0)

# estimating the parameters
data<-cbind(X,delta,Z)
result<-NPMLEcmprsk(data)
result

# plot probability of type-specific failures
logistic<-function(coef.alpha,covariates)
exp(cbind(1,covariates)

range<-seq(min(Z),max(Z),0.1)

plot(range,logistic(result$coef.alpha,range),type="l"
,xlab="covariate",ylab="Case fatality rate")
lines(range,logistic(result$coef.alpha.95.lower.CI,range),lty=2)
lines(range,logistic(result$coef.alpha.95.upper.CI,range),lty=2)

points(Z,logistic(result$coef.alpha,Z),cex=0.7)

## End(Not run)
```

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