Package ‘uniah’

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Title Unimodal Additive Hazards Model
Type Package
Version 1.0
Date 2016-12-28
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Description Nonparametric estimation of a unimodal or U-shape covariate effect under additive hazards model.
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uniah-package

Fit Unimodal Additive Hazards Model

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References

Yunro Chung, Anastasia Ivanova, Michael M. Hudgens, Jason P. Fine, Shape restricted additive hazards model (in preparation).

uniah

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Description

Nonparametric estimation of a unimodal or U-shape covariate effect for additive hazard model.

Usage

uniah(formula, trt, data, shape, mode, M, maxdec, maxiter, eps)

Arguments

- formula: a formula object: a response ~ a univariate covariate. The response must be survival outcome using the Surv function.
- trt: Treatment group. It must be coded by 0 or 1. This argument is optional.
- data: data.frame or list that includes variables named in the formula argument.
- shape: direction of the covariate effect on the hazard function, "unimodal" or "ushape"
- mode: mode of the unimodal or ushape hazard function, "known" or "unknown" (default is "unknown")
- M: A value for mode, which is only required when mode="known".
- maxdec: maximum number of decimal for output (default is 3).
- maxiter: maximum number of iteration (default is 10^3).
- eps: stopping convergence criteria (default is 10^-3).
Details

The uniah function allows to analyze shape restricted additive hazards model, defined as

\[ \lambda(t|z, \text{trt}) = \lambda_0(t) + \psi(z) + \beta \text{trt}, \]

where \( \lambda_0 \) is a baseline hazard function, and \( \psi \) is a unimodal or ushaped function, \( z \) is a univariate variable, \( \beta \) is a regression parameter and \( \text{trt} \) is a binary treatment group variable. One point at mode is fixed with \( \psi(M) = 0 \). For known mode, \( M \) has to be prespecified. For unknown mode, \( M \) does not have to be fixed. A direction of \( \psi \) is defined as unimodal or ushape prior to data analysis. Monotone covariate effects are also considered by setting a mode to the left or right end point of \( Z \). Quadratic pool adjacent violators algorithm is used.

Author(s)

Yunro Chung [cre], Anastasia Ivanova, Michael G. Hudgens and Jason P. Fine

References

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Examples

```r
#require(Iso)
#require(survival)
#require(ahaz)

###
# 1. unimodal with known mode
###
# 1.1. create a test data set
test1=list(
  time= c(9, 7, 5, 9, 5, 3, 8, 7, 9, 7),
  status=c(1, 1, 0, 1, 0, 1, 1, 1, 1, 1),
  z= c(2, 8, 1, 3, 2, 4, 6, 8, 3)
)

# 1.2. Fit isotonic proportional hazards model
res1=uniah(Surv(time,status)~z, data=test1, shape='unimodal', mode='known', M=5)

# 1.3. print result
res1

# 1.4 figure
plot(res1)

###
# 2. unimodal with known mode with treatment group
###
# 2.1. create a test data set 1
test1=list(
```
time = c(2, 7, 3, 7, 8, 1, 2, 2, 9, 8),
status = c(1, 0, 1, 1, 0, 0, 1, 1, 0),
z = c(4, 9, 5, 5, 1, 3, 8, 8, 1, 2),
trt = c(1, 1, 1, 1, 0, 0, 0, 0, 0)
)

# 2.2. Fit isotonic proportional hazards model
c r n fit isotonic proportional hazards model
res2 = uniah(surv(time, status ~ z, trt = trt, data = test1, shape = 'unimodal', mode = 'known', M = 6)

# 2.3. print result
c r n print result
res2

# 2.4 figure
c r n figure
plot(res2)

###
### 3. ushape with unknown mode
###
# 3.1. create a test data set
c r n create a test data set
test3 = list(
  time = c(3, 4, 5, 4, 1, 8, 1, 9, 2, 8, 2, 5, 7, 2, 2, 3, 1, 1, 8),
  status = c(1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 1),
  z = c(10, 4, 6, 9, 2, 9, 9, 7, 6, 1, 2, 2, 7, 4, 8, 5, 7, 10, 4, 8)
)

# 3.2. Fit isotonic proportional hazards model
c r n fit isotonic proportional hazards model
res3 = uniah(surv(time, status ~ z, data = test3, shape = 'ushape', mode = 'unknown')

# 3.3 print result
c r n print result
res3

# 3.4 Figure
c r n Figure
plot(res3)

###
# 4. More arguments for plot.uniah (S3method)
###
# 4.1 renames labels
#plot(res3, main = "Ush", ylab = "RD", xlab = "Cov", lglab = "Cov wt obs", lgloc = "center", lgcex = 1.5)

# 4.2 removes labels and changes line and point parameters
#plot(res3, main = NA, ylab = NA, xlab = NA, lglab = NA, lty = 2, lcol = 2, lwd = 2, pch = 3, pcol = 4, pcex = 1.5)
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*Topic  **Unimodal regression, Survival analysis, Constrained estimation**

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