

Package ‘aisoph’

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Type Package

Title Additive Isotonic Proportional Hazards Model

Version 0.4

Date 2023-03-03

Description

Nonparametric estimation of additive isotonic covariate effects for proportional hazards model.

License GPL (>= 2)

Depends R (>= 4.2.0), Iso, survival

NeedsCompilation no

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aisoph-package	<i>Additive Isotonic Proportional Hazards Model</i>
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References

Yunro Chung, Anastasia Ivanova, Jason P. Fine, Additive isotonic proportional hazards models (working in progress).

aisoph

Fit Additive Isotonic Proportional Hazards Model

Description

Nonparametric estimation of additive isotonic covariate effects for proportional hazards model.

Usage

```
aisoph(time, status, z1, z2, x, shape1, shape2, K1, K2, maxiter, eps)
```

Arguments

time	survival time. It must be greater than 0.
status	censoring indication. It must be 0 or 1.
z1	First covariate under order-restriction.
z2	Second covariate under-order restriction.
x	Additional covariates (vector or data.frame). This argument is optional
shape1	Shape-restriction for z_1 , "increasing" or "decreasing".
shape2	Shape-restriction for z_2 , "increasing" or "decreasing".
K1	anchor constraint for z_1 .
K2	anchor constraint for z_2 .
maxiter	maximum number of iteration (default is 10^5).
eps	stopping convergence criteria (default is 10^{-3}).

Details

The aisoph function allows to analyze additive isotonic proportional hazards model, which is defined as

$$\lambda(t|z_1, z_2, x) = \lambda_0(t) \exp(\psi_1(z_1) + \psi_2(z_2) + \beta x),$$

where λ_0 is an unspecified baseline hazard function, ψ_1 and ψ_2 are monotone increasing (or decreasing) functions in z_1 and z_2 , respectively, x is a covariate, and β is a regression parameter. If x is omitted in the formulation above, ψ_1 and ψ_2 are only estimated.

The model is not identifiable without the anchor constraint, $\psi_1(K_1) = 0$ and $\psi_2(K_2) = 0$. By default, K_1 and K_2 are set to medians of z_1 and z_2 values, respectively. The choice of the anchor points is less important in the sense that hazard ratios do not depend on the anchors.

Value

A list of class isoph:

iso1	data.frame estimated ψ_1 , estimated $\exp(\psi_1)$, and cens at z_1 , where $\exp(\psi_1)$ is a hazard ratio between z_1 and K_1 , and cens="no" if (at least one) subject is not censored at z_1 or cens="yes" otherwise.
iso2	data.frame estimated ψ_2 , estimated $\exp(\psi_2)$, and cens at z_2 , where $\exp(\psi_2)$ is a hazard ratio between z_2 and K_2 , and cens="no" if (at least one) subject is not censored at z_2 or cens="yes" otherwise.
est	data.frame with estimated β , and $\exp(\beta)$.
conv	status of algorithm convergence.
shape1	shape-constrain for ψ_1 .
shape2	shape-constrain for ψ_2 .
K1	anchor point for K_1 .
K2	anchor point for K_2 .

Author(s)

Yunro Chung [aut, cre]

References

Yunro Chung, Anastasia Ivanova, Jason P. Fine, Additive isotonic proportional hazards models (working in progress).

Examples

```
#require(survival)
#require(Iso)

###
# 1. time-independent covariate with monotone increasing effect
###
# 1.1. create a test data set 1
time= c(1, 6, 3, 6, 7, 8, 1, 4, 0, 2, 1, 5, 8, 7, 4)
```

```
status=c(1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1)
z1=      c(3, 1, 2, 4, 8, 3, 3, 4, 1, 9, 4, 2, 2, 8, 5)
z2=      c(1, 3, 5, 6, 1, 7, 6, 8, 3, 4, 8, 8, 5, 2, 3)

# 1.2. Fit isotonic proportional hazards model
res1 = aisoph(time=time, status=status, z1=z1, z2=z2,
              shape1="increasing", shape2="increasing")

# 1.3. print result
res1

#1.4. plot
plot(res1)

###
# 2. time-independent covariate with monotone increasing effect
###
# 2.1. create a test data set 1
time=  c(0,4,8,9,5,6,9,8,2,7,4,2,6,2,5,9,4,3,8,2)
status=c(0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,0,1)
z1=     c(3,2,1,1,3,1,8,4,3,6,2,9,9,0,7,7,2,3,4,6)
z2=     c(3,6,9,9,4,3,9,8,4,7,2,3,1,3,7,0,1,6,4,1)
trt=    c(0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1)

# 2.2. Fit isotonic proportional hazards model
res2 = aisoph(time=time, status=status, z1=z1, z2=z2, x=trt,
              shape1="increasing", shape2="increasing")

# 2.3. print result
res2

#2.4. plot
plot(res2)
```

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