Package 'rpls'

July 23, 2025

Type Package

Title Robust Partial Least Squares

Version 0.6.0

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Description A robust Partial Least-Squares (PLS) method is implemented that is robust to outliers in the residuals as well as to leverage points. A specific weighting scheme is applied which avoids iterations, and leads to a highly efficient robust PLS estimator.

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Imports pcaPP, robustbase

NeedsCompilation no

Repository CRAN

Date/Publication 2020-05-07 13:30:02 UTC

Contents

`pramml` *Partial Robust Adaptive Modified Maximum Likelihood*

Description

Robust Adaptive Modified Maximum Likelihood (RAMML) estimators can be used in the context of PLS to obtain scores and loadings in the latent regression model. The corresponding method is called Partial RAMML (PRAMML).

Usage

```
pramml(X, y, a, reg = "lts", pmml, opt = "l1m", usesvd = FALSE)
```

Arguments

X	predictor matrix
y	response variable
a	number of PLS components
reg	regression procedure to be used to compute initial estimate of parameter for the linearization of the intractable term; choices are LTS regression ("lts") and S regression ("s")
pmml	shape parameter of long-tailed symmetric distribution (considered as robustness tuning constant)
opt	if "l1m" the mean centering is done by the l1-median; otherwise if "median" the coordinate-wise median is taken
usesvd	if TRUE singular value decomposition is performed; logical, default is FALSE

Value

coef	vector with regression coefficients
intercept	coefficient for intercept
wy	vector of length(y) with residual weights
wt	vector of length(y) with weights for leverage
w	overall weights
scores	matrix with PLS X-scores
loadings	matrix with PLS X-loadings
fitted.values	vector with fitted y-values
loadings	column means of X
fitted.values	mean of y

Author(s)

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References

S. Acitas, Robust Statistical Estimation Methods for High-Dimensional Data with Applications, tech. rep., TUBITAK 2219, International Post Doctoral Research Fellowship Programme, 2019.

Examples

```
U <- c(rep(2,20), rep(5,30))
X <- replicate(6, U+rnorm(50))
beta <- c(rep(1, 3), rep(-1,3))
e <- c(rnorm(45,0,1.5),rnorm(5,-20,1))
y <- X%*%beta + e
res <- pramml(X, y, 4,"s", 16.5, opt ="l1m")
```

PRM *Robust PLS*

Description

Robust PLS by partial robust M-regression.

Usage

```
PRM(formula,data,a,wfunX,wfunY,center.type,scale.type,usesvd,numit,prec)
```

Arguments

formula	an object of class formula
data	a data frame which contains the variables given in formula
a	number of PLS components
wfunX	weight function to downweight leverage points; predefined weight funcktions "Fair", "Huber", "Tukey" and "Hampel" with respective tuning constants are passed via a list object, e.g. list("Fair",0.95)
wfunY	weight function to downweight residuals; predefined weight funcktions "Fair", "Huber", "Tukey" and "Hampel" with respective tuning constants are passed via a list object, e.g. list("Fair",0.95)
center.type	type of centering of the data in form of a string that matches an R function, e.g. "median"
scale.type	type of scaling for the data in form of a string that matches an R function, e.g. "qn" or alternatively "no" for no scaling
numit	the number of maximal iterations for the convergence of the coefficient estimates
prec	a value for the precision of estimation of the coefficients
usesvd	if TRUE singular value decomposition is performed; logical, default is FALSE

Details

M regression is used to robustify PLS. Employment of seperate weight functions for leverage points and residuals.

Value

coef	vector with regression coefficients
intercept	coefficient for intercept
wy	vector of length(y) with residual weights
wt	vector of length(y) with weights for leverage
w	overall weights
scores	matrix with PLS X-scores
loadings	matrix with PLS X-loadings
fitted.values	vector with fitted y-values

Author(s)

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References

S. Serneels, C. Croux, P. Filzmoser, and P.J. Van Espen. Partial robust M-regression. Chemometrics and Intelligent Laboratory System, Vol. 79(1-2), pp. 55-64, 2005.

Examples

```
U <- c(rep(2,20), rep(5,30))
X <- replicate(6, U+rnorm(50))
beta <- c(rep(1, 3), rep(-1,3))
e <- c(rnorm(45,0,1.5),rnorm(5,-20,1))
y <- X%*%beta + e
d <- as.data.frame(X)
d$y <- y
res <- PRM(y~., data=d, 3, wfunX=list("Fair",0.95),
wfunY=list("Fair",0.95), center.type = "median",
scale.type = "no",usesvd = FALSE,
numit = 100, prec = 0.01)
res$coef
```

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ramml *Robust Adaptive Modified Maximum Likelihood*

Description

Modified Maximum Likelihood (MML) estimators are asymptotically equivalent to the ML estimators but their methodology works under the assumption of a known shape parameter. Robust Adaptive MML estimators weaken this assumption and are robust to vertical outliers as well as leverage points.

Usage

```
ramml(X,y,p,e)
```

Arguments

X	predictor matrix
y	response variable
p	shape parameter of long-tailed symmetric distribution (considered as robustness tuning constant)
e	parameter for the linearization of the intractable term

Value

`coef`	vector of coefficients
`scale`	estimate of sigma
`fitted.values`	vector with fitted y-values
`residuals`	vector with y-residuals

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References

S. Acitas, Robust Statistical Estimation Methods for High-Dimensional Data with Applications, tech. rep., TUBITAK 2219, International Post Doctoral Research Fellowship Programme, 2019.

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