Package ‘ccrs’

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Type Package

Title Correct and Cluster Response Style Biased Data

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Description Functions for performing Correcting and Clustering response-style-biased preference data (CCRS). The main functions are correct.RS() for correcting for response styles, and ccrs() for simultaneously correcting and content-based clustering. The procedure begin with making rank-ordered boundary data from the given preference matrix using a function called create.ccrsdata(). Then in correct.RS(), the response style is corrected as follows: the rank-ordered boundary data are smoothed by I-spline functions, the given preference data are transformed by the smoothed functions. The resulting data matrix, which is considered as bias-corrected data, can be used for any data analysis methods. If one wants to cluster respondents based on their indicated preferences (content-based clustering), ccrs() can be applied to the given (response-style-biased) preference data, which simultaneously corrects for response styles and clusters respondents based on the contents. Also, the correction result can be checked by plot.crs() function.

License GPL (>= 2)

Depends R (>= 3.5.0)

Imports cds, colorspace, dplyr, graphics, limSolve, lsbclust, methods, msm, parallel, stats, utils

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R topics documented:

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**ccrs-package**

*Correcting and Clustering preference data in the presence of response style bias.*

**Description**

Corrects and clusters response-style-biased data.

**Author(s)**

Mariko Takagishi

**References**


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**ccrs**

*Correcting and Clustering response style biased data*

**Description**

Applies CCRS to ccrs.data.list.

**Usage**

```r
ccrs(ccrs.data.list,K,K,lambda=lambda,
tandem.initial=FALSE,
tol = 1e-5, maxit = 50, trace = 1, nstart = 3, parallel=F,verbose=T)
```

**Arguments**

- `ccrs.data.list`: A list generated by `create.ccrsdata`.
- `K`: An integer indicating the number of content-based clusters used for CCRS estimation.
- `lambda`: A numeric value indicating lambda used for CCRS estimation.
- `tandem.initial`: A logical value indicating whether the 1st initial value is generated by CCRS tandem initialization. See Section 3.3 in the paper for the detail.
tol  A numeric value indicating the absolute convergence tolerance
maxit  An integer indicating the maximum number of iterations
trace  An non-negative integer. If positive, tracing information on the progress of the
optimization is produced. Higher values produce more tracing information.
nstart  An integer indicating the number of random initial values.
parallel  A logical value indicating parallelization over starts is used.
verbose  A logical value indicating if the progress is printed during the iteration (only
when parallel==FALSE).

Value
Returns a list with the following elements.

G  A K by m matrix of content-based cluster centroid.
cls.cont.vec  A vector of integers (from 1:K) indicating the content-based cluster to which
each respondent is allocated.
opt.obval  An optimal value of objective function.
crs.list  A list of class crs, same as the one generated by correct.rs.

References
Takagishi, M., Velden, M. van de & Yadohisa, H. (2019). Clustering preference data in the presence
of response style bias, to appear in British Journal of Mathematical and Statistical Psychology.

See Also
correct.rs

Examples
###data setting
n <- 30 ; m <- 10 ; H.true <- 2 ; K.true <- 2 ; q <- 5
datagene <- generate.rsdata(n=n,m=m,K.true=K,true,H.true=H.true,q=q,clustered.rs = TRUE)
###obtain n x m data matrix
X <- datagene$X
cccrsdata.list <- create.cccrsdata(X,q=q)
###CRS
lam <- 0.8 ; K <- 2
cccrs.list <- cccrs(cccrsdata.list,K=K,lam=lam)
###check content-based clustering result
cccrs.list$cls.cont.vec
###check correction result
plot(cccrs.list$crs.list)
**convert.X2F**

*Convert data matrix to rank-ordered boundary data*

**Description**

Converts data matrix to rank-ordered boundary data.

**Usage**

```r
convert.X2F(X, q)
```

**Arguments**

- **X**: An n by m categorical data matrix.
- **q**: An integer indicating the maximum rating.

**Value**

An n by q-1 scaled rank-ordered boundary data.

**correct.rs**

*Correct response-style-biased data*

**Description**

Corrects response-style-biased data, given `ccrsdata.list` created by `create.ccrsdata`.

**Usage**

```r
correct.rs(ccrsdata.list)
```

**Arguments**

- **ccrsdata.list**: A list generated by `create.ccrsdata`, which contains `Fmat`, `Mmat.q1`, `Mmat.q` and `X`.

**Value**

Returns an object of `crs` with the following elements.

- **Beta**: An n by q-1 matrix of coefficients for response functions.
- **Y.hat**: An n by m matrix of corrected data matrix.
- **MB**: An n by q matrix of values of response functions evaluated at the midpoint between boundaries.
create.ccrsdata

Create a dataset for CCRS

Description

Creates a dataset for CCRS from a preference data matrix.

Usage

create.ccrsdata(X, q=q)

Arguments

X An n by m categorical data matrix.
q An integer indicating the maximum rating.

Details

For the difference between Mmat.q and Mmat.q1 in the resulting list, see Section 3.2 in reference paper.

Value

Returns a list with the following elements.

Fmat An n by q-1 matrix of scaled rank-ordered boundary data.
Mmat.q1 A q-1 by 3+1 matrix of I-spline basis functions, evaluated at the boundaries. +1 indicates all 0 intercepts.
Mmat.q A q by 3+1 matrix of I-spline basis functions, evaluated at the midpoints between boundaries.
X An n by m categorical data matrix same as the input X.
References


See Also

correct.rs

generate.rsdata

Simulate preference data to apply CCRS

Description

Simulates artificial preference data containing content-based (and response-style-based) clusters.

Usage

generate.rsdata(n=n,m=m,q=q,K.true=K.true,H.true=NULL,clustered.rs=FALSE, cls.cont.vec=NULL,cls.rs.vec=NULL,savedata=FALSE)

Arguments

n An integer indicating the number of respondents.
m An integer indicating the number of items.q An integer indicating the maximum rating.
K.true An integer indicating the true number of content-based clusters for n respondents.
H.true An integer indicating the true number of response-style-based clusters for n respondents. This is needed when clustered.rs=TRUE.clustered.rs A logical value indicating whether response-style-based cluster structure exists in generated data. If TRUE, coefficients of L-spline are generated by response-style-based clusters. The default is clustered.rs=FALSE.cls.cont.vec A vector of integers (from 1:K.true) of length n indicating the content-based cluster to which each respondent is allocated in artificial data. If it’s NULL, it is generated automatically.cls.rs.vec A vector of integers (from 1:H.true) of length n indicating the response-style-based clusters. If it’s NULL and clustered.rs==T, it is generated randomly.savedata A logical value indicating whether artificial data are saved as csv files. The default is savedata=FALSE.
Value

A list with the following elements:

- **X**: An n by m matrix of categorical variables.
- **X.star**: An n by m matrix of true preference data $X^*$.
- **X.nors**: An n by m matrix of categorical variables transformed by reference boundaries.
- **cls.cont.vec**: A vector of integers (from 1:H.true) indicating content-based clusters used to generate artificial data.
- **cls.rs.vec**: A vector of integers (from 1:H.true) indicating response-style-based clusters used to generate artificial data.

References


See Also

- `create.ccrsdata`

Examples

```r
# data setting
n <- 30; m <- 10; H.true <- 2; K.true <- 2; q <- 5
datagene <- generate.rsdata(n=n, m=m, K.true=K.true, H.true=H.true, q=q, clustered.rs = TRUE)
# obtain n x m data matrix
X <- datagene$X
```

Description

Plots results of correction (1st plot: estimated response functions, 2nd plot: coefficient plot. See Appendix A of the reference paper for the 2nd plot).

Usage

```r
## S3 method for class 'crs'
plot(x, H = NULL, cls.rs.vec = NULL, ...)
```
plot.crs

Arguments

x  
An object of class crs.

h  
An integer indicating the number of response-style-based clusters to display the correction result. If h=NULL and cls.rs.vec=NULL, h is set as h=n. If h=NULL but cls.rs.vec!=NULL, h is set as h=max(cls.rs.vec). The default is h=NULL.

cls.rs.vec  
An integer vector of length n indicating response-style-based clusters for n respondents. If cls.rs.vec=NULL and hA=null, clusters are determined by k-means clustering of Beta. The default is cls.rs.vec=NULL.

...  
Additional arguments passed to plot.

Details

Correction results for each respondent are displayed. If either response-style-based clusters or the number of response-style-based clusters are specified, the correction results of response-style-based clusters are displayed.

References


See Also

ccrs

Examples

###data setting
n <- 30 ; m <- 10 ; H.true <- 2 ; K.true <- 2 ; q <- 5
datagene <- generate.rsdata(n=n,m=m,K.true=K,true,H.true=H.true,q=q,clustered.rs = TRUE)
###obtain n x m data matrix
X <- datagene$X
cccrsdata.list <- create.cccrsdata(X,q=q)
crs.list <- correct.rs(cccrsdata.list)
###You can check correction result using this \code{crs.plot} function.
plot(crs.list)

###You can also check correction result obtained
###by a simultaneous analysis of correction and content-based clustering.
###CCRS
lam <- 0.8 ; K <- 2
cccrs.list <- cccrs(cccrsdata.list,K=K, lam=lam)
###check correction result using this \code{crs.plot} function.
plot(cccrs.list$crrs.list)
Transform data by the estimated response function

Description

Transforms data matrix by estimated response functions.

Usage

transformRSdata(X,Beta=beta, Mmat.q=Mmat.q)

Arguments

- **X**: An n by m categorical data matrix.
- **Beta**: An n by q-1 matrix of coefficients for response functions.
- **Mmat.q**: A q by 3+1 matrix of 1-spline basis functions, evaluated at the midpoints between boundaries.

Value

Returns a list with the following elements.

- **yHat**: An n by m matrix of corrected data matrix.
- **MB**: An n by q matrix of values of response functions evaluated at the midpoint between boundaries.
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