Package 'radviz3d'

May 9, 2026

Title 3D Radial Visualization

Version 2.3.1

Description Creating 3D radial visualizations of multivariate data.
The package extends traditional radial coordinate visualization (RadViz) techniques to three-dimensional space, enabling enhanced exploration and analysis of high-dimensional datasets through interactive 3D plots. Zhu, Dai & Maitra (2022) <doi:10.1080/10618600.2021.2020129>.

Depends R (>= 3.5.0)

License GPL (>= 2)

Encoding UTF-8

LazyData true

Imports rgl (>= 0.100.19)

Suggests MixSim, gtools

RoxygenNote 7.1.1

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NeedsCompilation no

Repository CRAN

Date/Publication 2026-02-27 08:30:02 UTC

Contents

`celadons` *Compositions of ancient Chinese celdon pieces*

Description

This dataset contains compositional data of ancient Chinese celdon from Longquan and Jingdezhen kiln from North Song to Ming Dynasties.

Usage

```
celadons
```

Format

A data frame with 19 variables and 88 observations.

mf Manufacturer of the celdon piece: FLQ for Jingdezhen and LG for Longquan

era The manufacturing time and part of the celdon piece in "time-part" format. There are two different parts (body (b) and glaze (g)) and four times (Song Dynasty (S), Yuan Dynasty (Y), Ming Dynastty(M) and Qing Dynasty (QC)).

Al2O3, CaO, CuO, Fe2O3, K2O, MgO, MnO, Na2O, P2O5, PbO2, Rb2O, SiO2, SrO, TiO2, Y2O3, ZnO, ZrO2 The contents of chemical components.

`Gtrans` *G-trasformation function*

Description

function to transform discrete or mixture of discrete and continuous datasets to continuous datasets with marginal normal(0,1).

Usage

```
Gtrans(data, cl = NULL, VariableSelection = FALSE, p_threshold = 0.05, ...)
```

Arguments

data	The dataset to be transforms. The dataset can be discretein all columns, continuous in all columns or a mixture of continuous columns and discrete columns.
cl	The class information of the dataset. This is not required when VariableSelection = FALSE.
VariableSelection	Logical. If true, anova will be performed to each variable to see whether there is a difference among groups for that variable. The varaible associated with Bonferroni adjusted p-value larger than a threshold will be removed.
p_threshold	The threshold for adjusted p-value in variable selection when VariableSelection = TRUE.
...	Additional arguments passed to internal functions.

Value

A transformed continuous dataset with the same copula as the input dataset and margianl normal(0,1).

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mrp *Max-Ratio Projection function*

Description

function to project high-dimensional datasets to lower dimention with max-ratio projection.

Usage

```
mrp(data, cl, nproj = 4, message = TRUE, ...)
```

Arguments

data	The dataset to apply MRP. Each row is an observation.
cl	The class identification for each observation. The length of cl should be the same as the number of rows of data.
nproj	The number of max-ratio directions to be used in projecting the original data to the projected data.
message	Logical. Wheather to show the accumulative variance explained by the projection directions or not.
...	Additional arguments passed to internal functions.

Value

A list with the elements

projected_df	The projected data with selected number of max-ratio directions.
pccumvar	The cummulative variance explained by the max-ratio principal components.

overlap_mat_sim *Overlap matrices for simulated data*

Description

This is a list containing three overlap matrices corresponding to the sim_data datasets, showing class separability.

Usage

```
overlap_mat_sim
```

Format

A list of 3 matrices, each 5x5, representing overlap between classes

radialvis3d *3D Radial Visualization function*

Description

3D Radial Visualization function

Usage

```
radialvis3d(
  data,
  domrp = TRUE,
  doGtrans = FALSE,
  sqrt_scale = FALSE,
  cl = NULL,
  color = NULL,
  pch = 16,
  colorblind = FALSE,
  axes = FALSE,
  point.cex = 1,
  with.coord.labels = TRUE,
  coord.labels = NULL,
  coord.font = 2,
  coord.cex = 1.1,
  with.class.labels = TRUE,
  class.labels = levels(factor(cl)),
  class.labels.locations = NULL,
  opt.anchor.order = FALSE,
  alpha = 0.02,
```

```
  lwd = 1,
  axes.col = "black",
  ret.trans = FALSE,
  ...
)
```

Arguments

data	The dataset to visualize. Each row is an observation.
domrp	Logical. If true, MRP is applied to the origianl dataset. The default number of PCs used is npc = 4.
doGtrans	Logical. If true, Gtrans is applied to the origianl dataset. @seealso Gtrans.
sqrt_scale	Logical. If true, the distance of the points to be visualization will be augmented to squre root of the orginal distance to make points further away from the origin.
cl	The class identification for each observation. The length of cl should be the same as the number of rows of data. If specified, different classes would be visualized with different colors.
color	The colors for different classes. If not specified, rainbow is used.
pch	The point character to be used. It is an integer of a vector of integers of the same length of the nrow of the dataset. See points for a complete list of characters.
colorblind	Logical.The colors for different classes.If true, poits are colorblind friendly.If false, rainbow is used.
axes	Logical.If true, Cartesian axes would be plotted.
point.cex	The size of the data point in RadViz3D. The default value is 1.
with.coord.labels	Logical. If true, labels of coordinates will be added to the visualization.
coord.labels	The labels for components of the dataset. When domrp = TRUE, the coord.labels will be changed to "Xi" representing the the ith direction obtained with MRP.
coord.font	The font for labels of components.
coord.cex	The size of the labels of components.
with.class.labels	Logical. If true, class labels will be added to the visualization.
class.labels	The labels for different classes in the dataset.
class.labels.locations	Locations to put labels for each class. If not specified, an optimal location for each class would be calculated.
opt.anchor.order	Logical. If true, the optimal order of anchor points corresponding to the components would be calculated. This is a very time consuming procedure. Not recommended if the number of components is larger then 6.
alpha	The alpha value that controls the transparency of the sphere in 3d visulization
lwd	The line width in the visualization
axes.col	Colors of the axes, if needed to be displayed
ret.trans	Logical parameter, returns the Radviz3D transformation if TRUE
...	Some other parameters from mrp and Gtrans and rgl functions.

Value

A list with the elements

`mrp.res` The result of MRP is the argument `domrp = TRUE`. See also `mrp`.

Examples

```
radialvis3d(data = iris[,-5], cl = iris[,5], domrp = TRUE)
```

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sarscov2.us.variants *COVID-19 US variants dataset*

Description

This is a compositional dataset of the COVID-19 variants in the US from 6/19/2021 to 9/18/2021.

Usage

```
sarscov2.us.variants
```

Format

A data frame of 140 observations and 14 variables.

group The date.

type weighted

region Region of the US labelled by numbers.

B.1.1.194, B.1.1.7, B.1.351, B.1.525, B.1.526, B.1.621, B.1.628, B.1.637, Delta, Other*, P.1 COVID-19 variants compositions.

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sim_data *Simulated datasets for testing*

Description

This is a list containing three simulated datasets, each with 500 observations and 5 classes, used for testing visualization methods.

Usage

```
sim_data
```

Format

A list of 3 data frames, each with 500 observations and 6 variables:

class Factor with 5 levels representing different classes

X1, X2, X3, X4, X5 Numeric variables with simulated data

wine *Chemical compositions of wine*

Description

The dataset contains chemical compositions of wines from 3 cultivars

Usage

```
wine
```

Format

A data frame of 178 observations and 14 variables:

cultivar The cultivar where the wine is produced

Ahl, Ash, Alk, Color, Flvds, Hue, Malic, Mg, Nonfp, ODdil, Phnls, Prol, Pthyns The content of chemical compositions of the wine

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