Package 'andrews'

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Type Package

Title Various Andrews Curves

Version 1.1.0

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Depends R (>= 2.10)

Description Visualisation of multidimensional data through different Andrews curves.

License GPL-3

URL https://github.com/sigbertklinke/andrews (development version)

Encoding UTF-8

LazyData true

RoxygenNote 7.2.2

Imports grDevices, graphics, primes

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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R topics documented:

andrews *Andrews curves*

Description

Andrews curves for visualization of multidimensional data. For colouring the curves see the details. For differences between andrews and andrews0 see the vignette("andrews"). With the same parameters called both functions should create the same plot. type==5 is a modification of type==3 and type==6 is a modification of type==4.

Usage

```
andrews(
  df,
  type = 1,
  clr = NULL,
  step = 100,
  ymax = 10,
  alpha = NULL,
  palcol = NULL,
  lwd = 1,
  lty = "solid",
  ...
)
```

Arguments

df	data frame
type	type of curve • 1: $f(t) = x_1/\sqrt{2} + x_2 \sin(t) + x_3 \cos(t) + x_4 \sin(2t) + x_5 \cos(2t) + ...$ • 2: $f(t) = x_1 \sin(t) + x_2 \cos(t) + x_3 \sin(2t) + x_4 \cos(2t) + ...$ • 3: $f(t) = x_1 \cos(t) + x_2 \cos(\sqrt{2t}) + x_3 \cos(\sqrt{3t}) + ...$ • 4: $f(t) = 0.5^{p/2}x_1 + 0.5^{(p-1)/2}x_2(\sin(t)+\cos(t)) + 0.5^{(p-2)/2}x_3(\sin(t)-\cos(t)) + 0.5^{(p-3)/2}x_4(\sin(2t)+\cos(2t)) + 0.5^{(p-4)/2}x_5(\sin(2t)-\cos(2t)) + ...)$ with p the number of variables • 5: $f(t) = x_1 \cos(\sqrt{p_0}t) + x_2 \cos(\sqrt{p_1}t) + x_3 \cos(\sqrt{p_2}t) + ...$ with $p_0=1$ and p_i the i-th prime number • 6: $f(t) = 1/\sqrt{2}(x_1 + x_2(\sin(t)+\cos(t)) + x_3(\sin(t)-\cos(t)) + x_4(\sin(2t)+\cos(2t)) + x_5(\sin(2t) - \cos(2t)) + ...)$
clr	number/name of column in the date frame for color of curves
step	smoothness of curves
ymax	maximum of y coordinate.
alpha	semi-transparent color ($0 < alpha < 1$) which are supported only on some devices

palcol	a function which generates a set of colors, see details
lwd	line width, a positive number, defaulting to 1.
lty	line type, can either be specified as an integer (0=blank, 1=solid (default), 2=dashed, 3=dotted, 4=dotdash, 5=longdash, 6=twodash) or as one of the character strings "blank", "solid", "dashed", "dotted", "dotdash", "longdash", or "twodash", where "blank" uses 'invisible lines' (i.e., does not draw them).
...	further parameters given to graphics::plot.default() except x, y, and type.

Details

If clr has length one then it is used as column number or column name for coloring the curves:

- If df[,clr] is numeric then palcol must be function which returns colors for values in the range \[0, 1\] using normalized variable. The default is function function(v) { hsv(0,1,v) }.
- Otherwise df[,clr] is converted to a factor and palcol must be a function which returns for each level a color. The parameter for palcol is the numbe of levels and the default is grDevices::rainbow(). If the length of clr is the number of rows of df then clr is interpreted as colors.

Andrews curves transform multidimensional data into curves. This package presents four types of curves.

Value

nothing

Author(s)

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References

- Andrews, D. F. (1972) Plots of High-Dimensional Data. Biometrics, vol. 28, no. 1, pp. 125-136.
- Khattree, R., Naik, D. N. (2002) Andrews Plots for Multivariate Data: Some New Suggestions and Applications. Journal of Statistical Planning and Inference, vol. 100, no. 2, pp. 411-425.

Examples

```
data(iris)
op <- par(mfrow=c(1,2))
andrews0(iris,clr=5,ymax=3)
andrews(iris,clr=5,ymax=3)
par(op)
andrews(iris,type=4,clr=5,ymax=NA)
```

andrews0 *Andrews curves*

Description

Andrews curves for visualization of multidimensional data. For differences between andrews and andrews2 see the 'vignette("andrews"). For colouring the curves see the details.

Usage

```
andrews0(
  df,
  type = 1,
  clr = NULL,
  step = 100,
  ymax = 10,
  main = NULL,
  sub = NULL
)
```

Arguments

df	data frame
type	type of curve • 1: $f(t) = x_1/\sqrt{2} + x_2 \sin(t) + x_3 \cos(t) + x_4 \sin(2t) + x_5 \cos(2t) + ...$ • 2: $f(t) = x_1 \sin(t) + x_2 \cos(t) + x_3 \sin(2t) + x_4 \cos(2t) + ...$ • 3: $f(t) = 0.5^{p/2}x_1 + 0.5^{(p-1)/2}x_2(\sin(t)+\cos(t)) + 0.5^{(p-2)/2}x_3(\sin(t)-\cos(t)) + 0.5^{(p-3)/2}x_4(\sin(2t)+\cos(2t)) + 0.5^{(p-6)/2}x_5(\sin(2t)-\cos(2t)) + ...)$ with p the number of variables • 4: $f(t) = 1/\sqrt{2}(x_1 + x_2(\sin(t)+\cos(t)) + x_3(\sin(t)-\cos(t)) + x_4(\sin(2t)+\cos(2t)) + x_5(\sin(2t) - \cos(2t)) + ...)$
clr	number/name of column in the date frame for color of curves
step	smoothness of curves
ymax	maximum of y coordinate.
main	main title for the plot
sub	sub title for the plot

Details

Andrews curves transform multidimensional data into curves. This package presents four types of curves

If df[,clr] is numeric then hsv(1,1,v) with the normalized values (on \[0, 1\]) of df[,clr] is used. Otherwise the number of unique values in nuv <- unique(df[,clr]) is used in connection with rainbow(nuv).

Value

nothing

Author(s)

Jaroslav Myslivec jaroslav.myslivec@upce.cz

References

- Andrews, D. F. (1972) Plots of High-Dimensional Data. Biometrics, vol. 28, no. 1, pp. 125-136.
- Khattree, R., Naik, D. N. (2002) Andrews Plots for Multivariate Data: Some New Suggestions and Applications. Journal of Statistical Planning and Inference, vol. 100, no. 2, pp. 411-425.

Examples

```
data(iris)
andrews0(iris,clr=5,ymax=3)
andrews0(iris,type=4,clr=5,ymax=2)
```

---

banknote *Swiss banknotes data*

Description

The data set contains six measurements made on 100 genuine and 100 counterfeit old-Swiss 1000-franc bank notes. The data frame and the documentation is a copy of mclust::banknote.

Usage

```
banknote
```

Format

A data frame with 200 rows and 7 columns:

Status the status of the banknote: `genuine` or `counterfeit`

Length Length of bill (mm)

Left Width of left edge (mm)

Right Width of right edge (mm)

Bottom Bottom margin width (mm)

Top Top margin width (mm)

Diagonal Length of diagonal (mm)

Source

Flury, B. and Riedwyl, H. (1988). Multivariate Statistics: A practical approach. London: Chapman & Hall, Tables 1.1 and 1.2, pp. 5-8.

deftype *deftype*

Description

Defines a function which can be used as basis for Andrews curves $f_t(t) = \sum_{j=1}^{p} x_{ij} f_i(t)$.

Usage

```
deftype(index = NULL, FUN = NULL, xlim = c(-pi, pi))
```

Arguments

index	index/name of the function
FUN	function of the form function(n, t) {...}
xlim	default range for displaying curves (default: c(-pi,pi))

Value

either a list of all functions or a single function

Examples

```
# define a new andrews curve, just with sine curves
deftype("sine", function(n, t) {
          n <- as.integer(if (n<1) 1 else n)
          m <- matrix(NA, nrow=length(t), ncol=n)
          for (i in 1:n) m[,i] <- sin(i*t)
          m
         })
andrews(iris, "sine")
# query
deftype()
deftype("sine")
```

normalize *Normalization*

Description

Normalization of variable.

Usage

```
normalize(ar)
```

Arguments

ar	numeric variable.

Details

Normalization of variable: ar<-(ar-min(ar))/(max(ar)-min(ar))

Value

Returns normalized variable.

Author(s)

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Examples

```
normalize(iris[,1])
```

---

numarray *Numeric array*

Description

Extracts numeric array from data frame.

Usage

```
numarray(df)
```

Arguments

df	data frame.

Details

Extracts numeric array from data frame.

Value

Returns numeric array.

Author(s)

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Examples

```
numarray(iris)
```

`selectand` *Selecting in Andrews curves*

Description

Selecting object utility in Andrews curves

Usage

```
selectand(df, type = 1, step = 100, ncol = 0, from = 0, to = 1, col = 2)
```

Arguments

`df`	data frame.
`type`	type of curve.
`step`	smoothness of curves.
`ncol`	number of column in data frame for selection.
`from`	from value.
`to`	to value.
`col`	color of selected objects.

Details

Define which objects will be selected (colored) in Andrews curves.

Value

Nothing

Author(s)

Jaroslav Myslivec jaroslav.myslivec@upce.cz

Examples

```
data(iris)
andrews(iris,clr=5,ymax=3)
selectand(iris,ncol=1,from=5,to=5.5,col=1)
```

zzz *Comparison*

Description

Creates and displays a temporary PDF file with different diagrams comparing `andrews` and `andrews0` plots.

Usage

```
zzz()
```

Value

nothing

Examples

```
if (interactive()) zzz()
```

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