

Package ‘archetypes’

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Type Package

Title Archetypal Analysis

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Description The main function `archetypes` implements a framework for archetypal analysis supporting arbitrary problem solving mechanisms for the different conceptual parts of the algorithm. NOTE: This package is used as real-world test application for the Roxygen documentation system. At the moment, Roxygen does not produce “good” help pages for the everyday use of a package; we refer to the vignette for a consistent package illustration.

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Revision 17

Collate ‘archetypes-barplot.R’ ‘archetypes-class.R’ ‘archetypes-kit-blocks.R’ ‘archetypes-kit.R’
‘archetypes-movie.R’ ‘pcplot.R’ ‘archetypes-pcplot.R’ ‘archetypes-plot.R’
‘archetypes-screepplot.R’ ‘archetypes-step.R’ ‘skeletonplot.R’

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adata	<i>Archetypes data approximation.</i>
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Description

Archetypes data approximation.

Usage

```
adata(zs, ...)
```

Arguments

zs	An archetypes-related object.
...	Further arguments.

Value

Approximated data matrix.

ahistory	<i>Archetypes history getter.</i>
----------	-----------------------------------

Description

Archetypes history getter.

Usage

```
ahistory(zs, ...)
```

Arguments

zs	An archetypes-related object.
...	Further arguments.

Value

The archetypes object of the requested step.

alphas	<i>Alpha getter.</i>
--------	----------------------

Description

Alpha getter.

Usage

```
alphas(zs, ...)
```

Arguments

zs	An archetypes-related object.
...	Further arguments.

Value

Alpha matrix.

archetypes *Perform archetypal analysis on a data matrix.*

Description

Perform archetypal analysis on a data matrix.

Usage

```
archetypes(data, k, maxIterations=100,  
           minImprovement=sqrt(.Machine$double.eps), maxKappa=1000,  
           verbose=TRUE, saveHistory=TRUE, family=archetypesFamily("default"))
```

Arguments

data	A numeric $n \times m$ data matrix.
k	The number of archetypes.
maxIterations	The maximum number of iterations.
minImprovement	The minimal value of improvement between two iterations.
maxKappa	The limit of kappa to report an ill-ness warning.
verbose	Print some details during execution.
saveHistory	Save each execution step in an environment for further analyses.
family	Blocks defining the underlying problem solving mechanisms; see archetypesFamily .

Value

An object of class [archetypes](#), see [as.archetypes](#).

Note

Please see the vignette for a detailed explanation!

References

Cutler and Breiman. Archetypal Analysis. Technometrics, 36(4), 1994. 338-348.

See Also

[stepArchetypes](#)

Examples

```
data(toy)  
a <- archetypes(toy, 3)
```

archetypesFamily *Archetypes family constructor.*

Description

Archetypes family constructor.

Usage

```
archetypesFamily(which=c("default", "ginv"))
```

Arguments

`which` The kind of archetypes family; currently ignored.

Details

This function returns a problem solving brick for each of the different conceptual parts of the algorithm. Currently, only the 'original' family is supported.

Value

A list containing a function for each of the different parts.

See Also

[archetypes](#)

as.archetypes *Archetypes object constructor.*

Description

Archetypes object constructor.

Usage

```
as.archetypes(archetypes, k, alphas, rss, iters, call, history, kappas,  
              betas, zas)
```

Arguments

archetypes	The archetypes; a $p \times m$ matrix, see atypes .
k	The number of archetypes;
alphas	The coefficients; a $n \times p$ matrix, see alphas .
rss	The residual sum of squares; see rss .
iters	The number of iterations to the convergence.
call	The call of the archetypes function.
history	If <code>saveHistory</code> set then an environment with the archetypes object for each execution step;
kappas	The kappas for each system of linear equations.
betas	The data coefficients; a $p \times n$ matrix.
zas	The temporary archetypes.

Value

A list with an element for each parameter and class attribute `archetypes`.

See Also

[archetypes](#), [atypes](#), [ntypes](#), [rss](#), [adata](#), [alphas](#), [ahistory](#), [nhistory](#)

atypes

Archetypes getter.

Description

Archetypes getter.

Usage

```
atypes(zs, ...)
```

Arguments

zs	An archetypes-related object.
...	Further arguments.

Value

Archetypes matrix.

barplot.archetypes *Barplot of archetypes.*

Description

Barplot of archetypes.

Usage

```
## S3 method for class 'archetypes':  
barplot (height, data, beside=TRUE,  
         percentage=FALSE, ...)
```

Arguments

height	An archetypes object.
data	The original data matrix.
beside	Portray the archetypes as stacked bars.
percentage	Show real values or percentages according to the original data.
...	Passed to the underlying barplot call.

Value

Undefined.

bestModel *Best model getter.*

Description

Best model getter.

Usage

```
bestModel (zs, ...)
```

Arguments

zs	An stepArchetypes object.
...	Further arguments.

Value

A list of length k of best models.

betas

Beta getter.

Description

Beta getter.

Usage

```
betas(zs, ...)
```

Arguments

zs An archetypes-related object.
... Further arguments.

Value

Beta matrix.

body

Exploring relationships in body dimensions

Description

Body girth measurements and skeletal diameter measurements, as well as age, weight, height and gender, are given for 507 physically active individuals - 247 men and 260 women.

Usage

```
body
```

Format

A data.frame containing 507 observations of 25 variables.

References

Heinz, Peterson, Johnson and Kerk. "Exploring relationships in body dimensions". Journal of Statistics Education, 11(2). <http://www.amstat.org/publications/jse/v11n2/datasets.heinz.html>

See Also

skel

iters	<i>Iteration getter.</i>
-------	--------------------------

Description

Iteration getter.

Usage

```
iters(zs, ...)
```

Arguments

zs	An archetypes-related object.
...	Further arguments.

Value

Number of iterations.

jd	<i>Annotated skeleton plot.</i>
----	---------------------------------

Description

Annotated skeleton plot.

Details

Displays a generic skeleton with annotations explaining the measurements available in data set [skel](#).

See Also

[skeletonplot](#), [skel](#)

moviepcplot	<i>Archetypes parallel coordinates plot movie.</i>
-------------	--

Description

Archetypes parallel coordinates plot movie.

Usage

```
moviepcplot(zs, data, show=c("atypes", "adata"), ssleep=0, bsleep=0,
            ...)
```

Arguments

zs	An archetypes object.
data	The data matrix.
show	Show archetypes or approximated data.
ssleep	Seconds to sleep before start.
bsleep	Seconds to sleep between each plot.
...	Passed to underlying pplot functions.

Value

Undefined.

movieplot	<i>Archetypes plot movie.</i>
-----------	-------------------------------

Description

Archetypes plot movie.

Usage

```
movieplot(zs, data, show=c('atypes', 'adata'),
          ssleep=0, bsleep=0, postfn=function(iter){}, ...)
```

Arguments

zs	An archetypes object.
data	The data matrix.
show	Show archetypes or approximated data.
ssleep	Seconds to sleep before start.
bsleep	Seconds to sleep between each plot.
postfn	Post plot function; is called in each iteration after the plot call.
...	Passed to underlying plot functions.

Value

Undefined.

movieplot2	<i>Archetypes plot movie 2.</i>
------------	---------------------------------

Description

Archetypes plot movie 2.

Usage

```
movieplot2(zs, data, show=atypes, ssleep=0, bsleep=0, zas.col=2,  
           zas.pch=13, old.col=rgb(1, 0.5, 0.5), ...)
```

Arguments

zs	An archetypes object.
data	The data matrix.
show	Shows only archetypes currently.
ssleep	Seconds to sleep before start.
bsleep	Seconds to sleep between each plot.
zas.col	Color of the intermediate archetypes.
zas.pch	Type of the intermediate archetypes points.
old.col	Color of the archetypes on step further.
...	Passed to underlying plot functions.

Details

Shows the intermediate steps of the algorithm;

Value

Undefined.

`nhistory` *Number of history steps getter.*

Description

Number of history steps getter.

Usage

```
nhistory(zs, ...)
```

Arguments

<code>zs</code>	An archetypes-related object.
<code>...</code>	Further arguments.

Value

The number of history steps available.

`ntypes` *Number of archetypes getter.*

Description

Number of archetypes getter.

Usage

```
ntypes(zs, ...)
```

Arguments

<code>zs</code>	An archetypes-related object.
<code>...</code>	Further arguments.

Value

Number of archetypes.

pcplot-methods *Parallel coordinates plot.*

Description

Parallel coordinates plot.

Usage

```
pcplot(x, ...)
## Default S3 method:
pcplot(x, col=gray(0.7), lty=1, var.label=TRUE,
       rx=NULL, ...)
## S3 method for class 'archetypes':
pcplot(x, data, data.col=gray(0.7), data.lwd=1,
       atypes.col=2, atypes.lwd=2, atypes.lty=1, chull, chull.col=1,
       chull.lwd=2, chull.lty=1, ...)
```

Arguments

x	An data.frame or a archetypes object.
col	Line color.
lty	Line type.
var.label	Axes labels.
rx	A $2 \times m$ matrix with ranges for each dimension.
data	A matrix or data frame.
data.col	Color of data lines.
data.lwd	Width of data lines.
atypes.col	Color of archetypes lines.
atypes.lwd	Width of archetypes lines.
atypes.lty	Type of archetypes lines.
chull	An integer vector giving the indices of the points from <code>data</code> lying on the convex hull.
chull.col	Color of convex hull lines.
chull.lwd	Width of convex hull lines.
chull.lty	Type of convex hull lines.
...	Passed to the underlying plot functions.

Details

Code copied from function [parcoord](#) of package `MASS` to simply play around with the visualization of archetypes. At a later date, when it is clear which visualisation is the best, the functionality is probably merged with the original function or it is possible with parallel coordinate plots which are available et all.

Value

Undefined.

plot-methods *Plot of data and archetypes.*

Description

Plot for two-dimensional data and archetypes.

Usage

```
## S3 method for class 'archetypes':
plot(x, y, data.col=gray(0.7), data.pch=19,
     atypes.col=2, atypes.pch=19, ahull.show=TRUE, ahull.col=atypes.col,
     chull, chull.col=1, chull.pch=19, adata.show=FALSE, adata.col=3,
     adata.pch=13, link.col=data.col, ...)
## S3 method for class 'stepArchetypes':
plot(x, y, data.col=gray(0.7), data.pch=19,
     atypes.col=(seq_len(length(x) * length(x[[1]])) + 1),
     atypes.pch=19, ahull.show=TRUE, ahull.col=atypes.col, ...)
```

Arguments

<code>x</code>	An <code>archetypes</code> or <code>stepArchetypes</code> object.
<code>y</code>	Data matrix or data frame.
<code>data.col</code>	Color of data points.
<code>data.pch</code>	Type of data points.
<code>atypes.col</code>	Color of archetypes points.
<code>atypes.pch</code>	Type of archetypes points.
<code>ahull.show</code>	Show approximated convex hull.
<code>ahull.col</code>	Color of approximated convex hull line.
<code>chull</code>	An integer vector giving the indices of the points from <code>data</code> lying on the convex hull.
<code>chull.col</code>	Color of convex hull points.
<code>chull.pch</code>	Type of convex hull points.
<code>adata.show</code>	Show approximated data with link to the original data.
<code>adata.col</code>	Color of approximated data points.
<code>adata.pch</code>	Type of approximated data points.
<code>link.col</code>	Color of link between approximated and original data points.
<code>...</code>	Passed to the underlying plot functions.

Value

Undefined.

Note

The link between approximated and original data is based on an idea and Matlab source code of Bernard Pailthorpe.

<code>rss</code>	<i>Residual sum of squares getter.</i>
------------------	--

Description

Residual sum of squares getter.

Usage

```
rss(zs, ...)
```

Arguments

<code>zs</code>	An archetypes-related object.
<code>...</code>	Further arguments.

Value

Residual sum of squares.

<code>skel</code>	<i>Exploring relationships in body dimensions, skeletal measurements</i>
-------------------	--

Description

Skeletal diameter measurements, as well as height and gender, are given for 507 physically active individuals - 247 men and 260 women.

This is a subset of the [body](#) data set.

Usage

```
skel
```

Format

A data.frame containing 507 observations of 11 variables.

References

Heinz, Peterson, Johnson and Kerk. "Exploring relationships in body dimensions". Journal of Statistics Education, 11(2). <http://www.amstat.org/publications/jse/v11n2/datasets.heinz.html>

See Also

body

skeletonplot

Skeleton plot.

Description

Skeleton plot.

Usage

```
skeletonplot(x, skel.width=100, skel.height=200, base.radius=2, xlab='',
            ylab='Height (cm)', xlim=(nrow(x) * c(0, skel.width)), ylim=c(0,
            skel.height), col=c(hipbase = 1, hip = 1, shoulderbase = 1,
            shoulder = 1, head = 1, elbow=2, wrist=3, knee=4, ankle=5,
            chest='purple1', pelvis=6), mtext=TRUE, skel.lwd=1, ...)
```

Arguments

<code>x</code>	Matrix or data.frame of skeleton data.
<code>skel.width</code>	Reference width for instance calculation.
<code>skel.height</code>	Reference height for instance calculation.
<code>base.radius</code>	Base radius for points.
<code>xlab</code>	The x label of the plot.
<code>ylab</code>	The y label of the plot.
<code>xlim</code>	Numeric of length 2 giving the x limits for the plot.
<code>ylim</code>	Numeric of length 2 giving the y limits for the plot.
<code>col</code>	Color of the different parts of the skeleton.
<code>mtext</code>	Label archetypes.
<code>skel.lwd</code>	Line width of skeleton.
<code>...</code>	Passed to underlying canvas plot function.

Details

Displays a schematic representation of skeleton data as available in dataset `skel`.

Value

List of skeleton instances.

See Also[skel](#), [jd](#)

stepArchetypes	<i>Runs archetypes algorithm repeatedly.</i>
----------------	--

Description

Runs archetypes algorithm repeatedly.

Usage

```
stepArchetypes(..., k, nrep=3, verbose=TRUE)
```

Arguments

...	Passed to archetypes function.
k	A vector of integers passed in turn to the k argument of archetypes .
nrep	For each value of k run archetypes nrep times.
verbose	Show progress during execution.

Value

A list with k elements and class attribute `stepArchetypes`. Each element is a list of class `repArchetypes` with nrep elements; only for internal usage.

Note

Please see the vignette for a detailed explanation!

See Also[atypes](#), [ntypes](#), [rss](#), [adata](#), [alphas](#), [ahistory](#), [nhistory](#)**Examples**

```
## Not run:
data(skel)
skel2 <- subset(skel, select=-Gender)
as <- stepArchetypes(skel2, k=1:5, verbose=FALSE)

## Residual sum of squares curve:
screplot(as)

## Select three archetypes and from that the best
## recurrence:
a3 <- bestModel(as[[3]])
## End(Not run)
```

`toy`*Toy data set*

Description

A simple artificial two-dimensional data set.

Usage

```
toy
```

Format

A `data.frame` containing 250 observations of 2 variables.

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