

Package ‘ggdendro’

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Title Create Dendrograms and Tree Diagrams Using 'ggplot2'

Description This is a set of tools for dendrograms and tree plots using 'ggplot2'. The 'ggplot2' philosophy is to clearly separate data from the presentation. Unfortunately the plot method for dendrograms plots directly to a plot device without exposing the data. The 'ggdendro' package resolves this by making available functions that extract the dendrogram plot data. The package provides implementations for 'tree', 'rpart', as well as diana and agnes (from 'cluster') diagrams.

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ggdendro-package	<i>Create Dendrograms and Tree Diagrams using 'ggplot2'</i>
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Description

This package enables you to create dendrograms and tree plots using `ggplot2::ggplot()`.

Details

The `ggplot2` philosophy is to clearly separate data from the presentation. Unfortunately the `plot.dendrogram()` plots directly to a plot device without exposing the data. The `ggdendro` package resolves this by making available functions that extract the dendrogram plot data. This data can be used with `ggplot`.

The function `dendro_data()` extracts data from different objects that contain dendrogram information. It is a generic function with methods for:

- `hclust`: `dendro_data.hclust()`
- `dendrogram`: `dendro_data.dendrogram()`
- `regression trees`: `dendro_data.tree()`
- `partition trees`: `dendro_data.rpart()`
- `agnes and diana`: `dendro_data.twins()`

These methods create an object of class `dendro`, consisting of a list of data frames. To extract the relevant data frames from the list, you can use the accessor functions:

- `segment()`: the line segment data
- `label()`: the text for each end segment
- `leaf_label()`: the leaf labels of a tree diagram

To plot a dendrogram, either construct a plot with `ggplot2::ggplot()` or use the function `ggdendrogram()`.

Author(s)

Andrie de Vries - <apdevries@gmail.com>

See Also[dendro_data\(\)](#)

as.dendro	<i>Coerces object to class dendro.</i>
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Description

Method for coercing object to class dendro.

Usage

```
as.dendro(segments, labels, leaf_labels = NULL, class)
```

Arguments

segments	data.frame with segment data
labels	data.frame with labels data
leaf_labels	data.frame with leaf label data
class	The class of the original model object, e.g. "hclust". This is used by ggdendrogram() to determine the angle and justification of labels

See Also[dendro_data\(\)](#) and [ggdendro-package\(\)](#)

dendro_data	<i>Extract cluster data from a model into a list of data frames.</i>
-------------	--

Description

This function provides a generic mechanism to extract relevant plotting data, typically line segments and labels, from a variety of cluster models.

Extract line segment and label data from [stats::dendrogram\(\)](#) or [stats::hclust\(\)](#) object. The resulting object is a list of data frames containing line segment data and label data.

Usage

```
dendro_data(model, ...)

## Default S3 method:
dendro_data(model, ...)

## S3 method for class 'dendrogram'
dendro_data(model, type = c("rectangle", "triangle"), ...)

## S3 method for class 'hclust'
dendro_data(model, type = c("rectangle", "triangle"), ...)

## S3 method for class 'twins'
dendro_data(model, type = c("rectangle", "triangle"), ...)
```

Arguments

model	object of class "dendrogram", e.g. the output of <code>as.dendrogram()</code>
...	ignored
type	The type of plot, indicating the shape of the dendrogram. "rectangle" will draw rectangular lines, while "triangle" will draw triangular lines.

Details

For `stats::dendrogram()` and `tree::tree()` models, extracts line segment data and labels.

Value

a list of data frames that contain the data appropriate to each cluster model

A list with components:

segments	Line segment data
labels	Label data

See Also

There are several implementations for specific cluster algorithms:

- `dendro_data.hclust()`
- `dendro_data.dendrogram()`
- `dendro_data.tree()`
- `dendro_data.rpart()`

To extract the data for line segments, labels or leaf labels use:

- `segment()`: the line segment data
- `label()`: the text for each end segment

- `leaf_label()`: the leaf labels of a tree diagram

`ggdendrogram()`

Other `dendro_data` methods: `dendro_data.rpart()`, `dendro_data.tree()`, `dendrogram_data()`, `rpart_labels()`

Other dendrogram/hclust functions: `dendrogram_data()`

Examples

```
require(ggplot2)

### Demonstrate dendro_data.dendrogram

model <- hclust(dist(USArrests), "ave")
dendro <- as.dendrogram(model)

# Rectangular lines
ddata <- dendro_data(dendro, type = "rectangle")
ggplot(segment(ddata)) +
  geom_segment(aes(x = x, y = y, xend = xend, yend = yend)) +
  coord_flip() +
  scale_y_reverse(expand = c(0.2, 0)) +
  theme_dendro()

# Triangular lines
ddata <- dendro_data(dendro, type = "triangle")
ggplot(segment(ddata)) +
  geom_segment(aes(x = x, y = y, xend = xend, yend = yend)) +
  theme_dendro()

# Demonstrate dendro_data.hclust

require(ggplot2)
hc <- hclust(dist(USArrests), "ave")

# Rectangular lines
hcdata <- dendro_data(hc, type = "rectangle")
ggplot(segment(hcdata)) +
  geom_segment(aes(x = x, y = y, xend = xend, yend = yend)) +
  coord_flip() +
  scale_y_reverse(expand = c(0.2, 0)) +
  theme_dendro()

# Triangular lines
hcdata <- dendro_data(hc, type = "triangle")
ggplot(segment(hcdata)) +
  geom_segment(aes(x = x, y = y, xend = xend, yend = yend)) +
  theme_dendro()

### Demonstrate the twins of agnes and diana, from package cluster

if (require(cluster)) {
  model <- agnes(votes.repub, metric = "manhattan", stand = TRUE)
```

```

dg <- as.dendrogram(model)
ggdendrogram(dg)
}

if (require(cluster)) {
  model <- diana(votes.repub, metric = "manhattan", stand = TRUE)
  dg <- as.dendrogram(model)
  ggdendrogram(dg)
}

```

dendro_data.rpart *Extract data from classification tree object for plotting using ggplot.*

Description

Extracts data to plot line segments and labels from a `rpart::rpart()` classification tree object. This data can then be manipulated or plotted, e.g. using `ggplot2::ggplot()`.

Usage

```

## S3 method for class 'rpart'
dendro_data(
  model,
  uniform = FALSE,
  branch = 1,
  compress = FALSE,
  nspace,
  minbranch = 0.3,
  ...
)

```

Arguments

model	object of class "tree", e.g. the output of <code>tree()</code>
uniform	if TRUE, uniform vertical spacing of the nodes is used; this may be less cluttered when fitting a large plot onto a page. The default is to use a non-uniform spacing proportional to the error in the fit.
branch	controls the shape of the branches from parent to child node. Any number from 0 to 1 is allowed. A value of 1 gives square shouldered branches, a value of 0 give V shaped branches, with other values being intermediate.
compress	if FALSE, the leaf nodes will be at the horizontal plot coordinates of 1:nleaves. If TRUE, the routine attempts a more compact arrangement of the tree. The compaction algorithm assumes uniform=TRUE; surprisingly, the result is usually an improvement even when that is not the case.

nospace	the amount of extra space between a node with children and a leaf, as compared to the minimal space between leaves. Applies to compressed trees only. The default is the value of branch.
minbranch	set the minimum length for a branch to minbranch times the average branch length. This parameter is ignored if uniform=TRUE. Sometimes a split will give very little improvement, or even (in the classification case) no improvement at all. A tree with branch lengths strictly proportional to improvement leaves no room to squeeze in node labels.
...	ignored

Details

This code is in essence a copy of `rpart::plot.rpart()`, retaining the plot data but without plotting to a plot device.

Value

A list of three data frames:

segments	a data frame containing the line segment data
labels	a data frame containing the label text data
leaf_labels	a data frame containing the leaf label text data

See Also

[ggdendrogram\(\)](#)

Other dendro_data methods: [dendro_data\(\)](#), [dendro_data.tree\(\)](#), [dendrogram_data\(\)](#), [rpart_labels\(\)](#)

Other rpart functions: [rpart_labels\(\)](#), [rpart_segments\(\)](#)

Examples

```
### Demonstrate rpart

if (require(rpart)) {
  require(ggplot2)
  fit <- rpart(Kyphosis ~ Age + Number + Start, method = "class",
              data = kyphosis)
  fitr <- dendro_data(fit)
  ggplot() +
    geom_segment(data = fitr$segments,
                aes(x = x, y = y, xend = xend, yend = yend)
    ) +
    geom_text(data = fitr$labels, aes(x = x, y = y, label = label)) +
    geom_text(data = fitr$leaf_labels, aes(x = x, y = y, label = label)) +
    theme_dendro()
}
```

dendro_data.tree *Extract data from regression tree object for plotting using ggplot.*

Description

Extracts data to plot line segments and labels from a `tree::tree()` object. This data can then be manipulated or plotted, e.g. using `ggplot2::ggplot()`.

Usage

```
## S3 method for class 'tree'
dendro_data(model, type = c("proportional", "uniform"), ...)
```

Arguments

model	object of class "tree", e.g. the output of <code>tree()</code>
type	Either <code>proportional</code> or <code>uniform</code> . If this partially matches "uniform", the branches are of uniform length. Otherwise they are proportional to the decrease in impurity.
...	ignored

Value

A list of three data frames:

segments	a data frame containing the line segment data
labels	a data frame containing the label text data
leaf_labels	a data frame containing the leaf label text data

Author(s)

Andrie de Vries, using code modified from original by Brian Ripley

See Also

[ggdendrogram\(\)](#)

Other `dendro_data` methods: [dendro_data\(\)](#), [dendro_data.rpart\(\)](#), [dendrogram_data\(\)](#), [rpart_labels\(\)](#)

Other tree functions: [get_data_tree_leaf_labels\(\)](#), [tree_labels\(\)](#), [tree_segments\(\)](#)

Examples

```
### Demonstrate tree

if (require(tree)) {
  require(ggplot2)
  require(MASS)
  data(cpus, package = "MASS")
```



```

cpus.ltr <- tree(log10(perf) ~ syct + mmin + mmax + cach + chmin + chmax,
                data = cpus)
tree_data <- dendro_data(cpus.ltr)
ggplot(segment(tree_data)) +
  geom_segment(aes(x = x, y = y, xend = xend, yend = yend, linewidth = n),
              colour = "lightblue"
            ) +
  scale_size("n") +
  geom_text(
    data = label(tree_data),
    aes(x = x, y = y, label = label), vjust = -0.5, size = 4
  ) +
  geom_text(
    data = leaf_label(tree_data),
    aes(x = x, y = y, label = label), vjust = 0.5, size = 3
  ) +
  theme_dendro()
}

```

ggdendrogram

Creates dendrogram plot using ggplot.

Description

This is a convenience function

Usage

```

ggdendrogram(
  data,
  segments = TRUE,
  labels = TRUE,
  leaf_labels = TRUE,
  rotate = FALSE,
  theme_dendro = TRUE,
  ...
)

```

Arguments

data	Either a dendro object or an object that can be coerced to class dendro using the dendro_data() function, i.e. objects of class dendrogram, hclust or tree
segments	If TRUE, show line segments
labels	if TRUE, shows segment labels
leaf_labels	if TRUE, shows leaf labels
rotate	if TRUE, rotates plot by 90 degrees
theme_dendro	if TRUE, applies a blank theme to plot (see theme_dendro())
...	other parameters passed to ggplot2::geom_text()

Value

A `ggplot2::ggplot()` object

See Also

[dendro_data\(\)](#)

Examples

```
### Demonstrate ggdendrogram

library(ggplot2)
hc <- hclust(dist(USArrests), "ave")

# Demonstrate plotting directly from object class hclust
p <- ggdendrogram(hc, rotate = FALSE)
print(p)
ggdendrogram(hc, rotate = TRUE)

# demonstrate converting hclust to dendro using dendro_data first
hcdata <- dendro_data(hc)
ggdendrogram(hcdata, rotate = TRUE, size = 2) +
  labs(title = "Dendrogram in ggplot2")
```

is.dendro

Tests whether an object is of class dendro.

Description

Is a dendro? Tests whether an object is of class dendro.

Usage

```
is.dendro(x)
```

Arguments

x Object to check

See Also

[dendro_data\(\)](#) and [ggdendro-package\(\)](#)

segment	<i>Returns segment, label or leaf-label data from dendro object.</i>
---------	--

Description

segment extracts line segments, label extracts labels, and leaf_label extracts leaf labels from a dendro object.

Usage

```
segment(x)
```

```
label(x)
```

```
leaf_label(x)
```

Arguments

x	dendro object
---	---------------

See Also

[dendro_data\(\)](#)

theme_dendro	<i>Creates completely blank theme in ggplot.</i>
--------------	--

Description

Sets most of the ggplot options to blank, by returning blank theme elements for the panel grid, panel background, axis title, axis text, axis line and axis ticks.

Usage

```
theme_dendro()
```

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