

# Package ‘ggtree’

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**Type** Package

**Title** an R package for visualization of tree and annotation data

**Version** 3.4.2

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**Description** 'ggtree' extends the 'ggplot2' plotting system which implemented the grammar of graphics. 'ggtree' is designed for visualization and annotation of phylogenetic trees and other tree-like structures with their annotation data.

**Depends** R (>= 3.5.0)

**Imports** ape, aplot, dplyr, ggplot2 (>= 3.0.0), grid, magrittr, methods, purrr, rlang, ggfun (>= 0.0.6), yulab.utils, tidyr, tidytree (>= 0.3.9), treeio (>= 1.8.0), utils, scales

**Suggests** emojiFont, ggimage, ggplotify, shadowtext, grDevices, knitr, prettydoc, rmarkdown, stats, testthat, tibble, glue

**Remotes** GuangchuangYu/treeio

**VignetteBuilder** knitr

**ByteCompile** true

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**License** Artistic-2.0

**URL** <https://www.amazon.com/Integration-Manipulation-Visualization-Phylogenetic-Computational-ebook/dp/B0B5NLZR1Z/>  
(book),  
<http://onlinelibrary.wiley.com/doi/10.1111/2041-210X.12628>  
(paper)

**BugReports** <https://github.com/YuLab-SMU/ggtree/issues>

**biocViews** Alignment, Annotation, Clustering, DataImport, MultipleSequenceAlignment, Phylogenetics, ReproducibleResearch, Software, Visualization

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## R topics documented:

add_colorbar . . . . .	4
applyLayoutDaylight . . . . .	5
as.polytomy . . . . .	5
collapse.ggtree . . . . .	6
Date2decimal . . . . .	7
decimal2Date . . . . .	7
expand . . . . .	8
facet_data . . . . .	8
facet_labeller . . . . .	9
facet_plot . . . . .	10
facet_widths . . . . .	11
flip . . . . .	11
geom_aline . . . . .	12
geom_balance . . . . .	13
geom_cladelab . . . . .	14
geom_cladelabel . . . . .	17
geom_cladelabel2 . . . . .	19
geom_hilight . . . . .	20
geom_inset . . . . .	23
geom_label2 . . . . .	24
geom_motif . . . . .	26
geom_nodelab . . . . .	27
geom_nodelab2 . . . . .	28
geom_nodepoint . . . . .	29
geom_point2 . . . . .	30
geom_range . . . . .	32
geom_rootedge . . . . .	33
geom_rootpoint . . . . .	34

geom_segment2 . . . . .	36
geom_strip . . . . .	37
geom_striplab . . . . .	39
geom_taxalink . . . . .	42
geom_text2 . . . . .	43
geom_tiplab . . . . .	44
geom_tiplab2 . . . . .	47
geom_tippoint . . . . .	48
geom_tree . . . . .	49
geom_tree2 . . . . .	50
geom_treescale . . . . .	51
geom_zoom_clade . . . . .	52
get.path . . . . .	53
getNodeAngle.df . . . . .	53
getNodesBreadthFirst.df . . . . .	54
getSubtree . . . . .	54
getSubtree.df . . . . .	55
getSubtreeUnrooted . . . . .	55
getSubtreeUnrooted.df . . . . .	56
getTreeArcAngles . . . . .	56
get_clade_position . . . . .	57
get_heatmap_column_position . . . . .	57
get_taxa_name . . . . .	58
ggdensitree . . . . .	59
ggtree . . . . .	60
ghheatmap . . . . .	62
gzoom . . . . .	64
gzoom.phylo . . . . .	65
hexpand . . . . .	66
label_pad . . . . .	67
layoutDaylight . . . . .	68
layoutEqualAngle . . . . .	68
layout_rectangular . . . . .	69
msaplot . . . . .	70
multiplot . . . . .	71
nodebar . . . . .	72
nodepie . . . . .	72
open_tree . . . . .	73
range_format . . . . .	74
revts . . . . .	74
rotate . . . . .	75
rotateTreePoints.df . . . . .	76
rotate_tree . . . . .	76
scaleClade . . . . .	77
scale_color . . . . .	78
scale_color_subtree . . . . .	78
scale_x_ggtree . . . . .	79
scale_x_range . . . . .	80

set_highlight_legend . . . . .	80
StatBalance . . . . .	81
td_filter . . . . .	81
td_mutate . . . . .	82
td_unnest . . . . .	83
theme_dendrogram . . . . .	84
theme_inset . . . . .	84
theme_tree . . . . .	85
theme_tree2 . . . . .	86
viewClade . . . . .	86
xlim_expand . . . . .	87
xlim_tree . . . . .	88
zoomClade . . . . .	89
%+>% . . . . .	89
%<+% . . . . .	90
%<% . . . . .	91

## Index 93

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add_colorbar	<i>add_colorbar</i>
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---

### Description

add\_colorbar legend

### Usage

```
add_colorbar(p, color, x = NULL, ymin = NULL, ymax = NULL, font.size = 4)
```

### Arguments

p	tree view
color	output of scale_color function
x	x position
ymin	ymin
ymax	ymax
font.size	font size

### Value

ggplot2 object

### Author(s)

Guangchuang Yu

---

applyLayoutDaylight    *applyLayoutDaylight*

---

**Description**

Apply the daylight algorithm to adjust the spacing between the subtrees and tips of the specified node.

**Usage**

```
applyLayoutDaylight(df, node_id)
```

**Arguments**

df	tree data.frame
node_id	is id of the node from which daylight is measured to the other subtrees.

**Value**

list with tree data.frame with updated layout using daylight algorithm and max\_change angle.

---

as.polytomy    *as.polytomy*

---

**Description**

collapse binary tree to polytomy by applying 'fun' to 'feature'

**Usage**

```
as.polytomy(tree, feature, fun)
```

**Arguments**

tree	tree object, 'phylo' object only
feature	selected feature
fun	function to select nodes to collapse

**Value**

polytomy tree

**Author(s)**

Guangchuang Yu

---

collapse.ggtree      *collapse-ggtree*

---

## Description

collapse a selected clade, which can later be expanded with the 'expand()' fuction if necessary

## Usage

```
## S3 method for class 'ggtree'
collapse(x = NULL, node, mode = "none", clade_name = NULL, ...)
```

## Arguments

x	tree view (i.e. the ggtree object). If tree_view is NULL, the last ggplot will be used.
node	internal node number
mode	one of 'none'(default), 'max', 'min' and 'mixed'. 'none' would simply collapse the clade as 'tip' and the rest will display a triangle, whose shape is determined by the farest/closest tip of the collapsed clade to indicate it
clade_name	set a name for the collapsed clade. If clade_name = NULL, do nothing
...	additional parameters to set the color or transparency of the triangle

## Value

tree view

## Author(s)

Guangchuang Yu

## See Also

expand

## Examples

```
x <- rtree(15)
p <- ggtree(x) + geom_tiplab()
p
p1 <- collapse(p, node = 17, mode = "mixed", clade_name = "cclade", alpha = 0.8, color = "grey", fill = "light blue")
```

---

Date2decimal	<i>Date2decimal</i>
--------------	---------------------

---

**Description**

convert Date to decimal format, eg "2014-05-05" to "2014.34"

**Usage**

Date2decimal(x)

**Arguments**

x                      Date

**Value**

numeric

**Author(s)**

Guangchuang Yu

---

decimal2Date	<i>decimal2Date</i>
--------------	---------------------

---

**Description**

convert decimal format to Date, eg "2014.34" to "2014-05-05"

**Usage**

decimal2Date(x)

**Arguments**

x                      numerical number, eg 2014.34

**Value**

Date

**Author(s)**

Guangchuang Yu

---

expand	<i>expand</i>
--------	---------------

---

**Description**

expand collapsed clade

**Usage**

```
expand(tree_view = NULL, node)
```

**Arguments**

tree_view	tree view (i.e. the ggtree object). If tree_view is NULL, the last ggplot object will be used.
node	internal node number to specify a clade. If NULL, using the whole tree

**Value**

tree view

**Author(s)**

Guangchuang Yu

**See Also**

collapse

**Examples**

```
x <- rtree(15)
p <- ggtree(x) + geom_tiplab()
p1 <- collapse(p, 17)
expand(p1, 17)
```

---

facet_data	<i>facet_data</i>
------------	-------------------

---

**Description**

extract data used in facet\_plot or geom\_facet

**Usage**

```
facet_data(tree_view, panel)
```



**Arguments**

tree\_view      ggtree object  
panel            data plotted in specific panel. If only one dataset used in the panel, return the data frame, else return a list of data frames.

**Value**

data frame or a list of data frames

**Author(s)**

Guangchuang Yu

**References**

G Yu, TTY Lam, H Zhu, Y Guan (2018). Two methods for mapping and visualizing associated data on phylogeny using ggtree. *Molecular Biology and Evolution*, 35(2):3041-3043. <https://doi.org/10.1093/molbev/msy194>

---

facet\_labeller      *facet\_labeller*

---

**Description**

function to relable selected panels created by 'geom\_facet' or 'facet-plot'

**Usage**

```
facet_labeller(p, label)
```

**Arguments**

p                    facet\_plot output  
label                new labels of facet panels

**Value**

ggplot object

**Author(s)**

Guangchuang Yu

---

facet_plot	<i>facet_plot</i>
------------	-------------------

---

### Description

plot tree associated data in an additional panel

### Usage

```
facet_plot(p, mapping = NULL, data, geom, panel, ...)
```

```
geom_facet(mapping = NULL, data, geom, panel, ...)
```

### Arguments

p	tree view
mapping	aes mapping for 'geom'
data	data to plot by 'geom', first column should be matched with tip label of tree
geom	geom function to plot the data
panel	panel name for plot of input data
...	additional parameters for 'geom'

### Details

'facet\_plot()' automatically re-arranges the input 'data' according to the tree structure, visualizes the 'data' on specific 'panel' using the 'geom' function with aesthetic 'mapping' and other parameters, and align the graph with the tree 'p' side by side. 'geom\_facet' is a 'ggplot2' layer version of 'facet\_plot'

### Value

ggplot object

### Author(s)

Guangchuang Yu

### References

G Yu, TTY Lam, H Zhu, Y Guan (2018). Two methods for mapping and visualizing associated data on phylogeny using ggtree. *Molecular Biology and Evolution*, 35(2):3041-3043. <https://doi.org/10.1093/molbev/msy194>

**Examples**

```
tr <- rtree(10)
dd = data.frame(id=tr$tip.label, value=abs(rnorm(10)))
p <- ggtree(tr)
facet_plot(p, 'Trait', data = dd, geom=geom_point, mapping=aes(x=value))
```

---

facet_widths	<i>facet_widths</i>
--------------	---------------------

---

**Description**

set relative widths (for column only) of facet plots

**Usage**

```
facet_widths(p, widths)
```

**Arguments**

p	ggplot or ggtree object
widths	relative widths of facet panels

**Value**

ggplot object by redrawing the figure (not a modified version of input object)

**Author(s)**

Guangchuang Yu

---

flip	<i>flip</i>
------	-------------

---

**Description**

exchange the position of 2 clades

**Usage**

```
flip(tree_view = NULL, node1, node2)
```

**Arguments**

tree_view	tree view (i.e. the ggtree object). If tree_view is NULL, the last ggplot will be used.
node1	node number of clade 1. It should share a same parent node with node2
node2	node number of clade 2. It should share a same parent node with node1

**Value**

ggplot object

**Author(s)**

Guangchuang Yu

**Examples**

```
set.seed(123)
x <- rtree(15)
p <- ggtree(x) + geom_tiplab() +
  geom_nodelab(aes(subset=!isTip, label=node), hjust = -.1, color = "red")
flip(p, 23, 24) ## Depends on the condition of your tree
```

---

geom\_aline

*geom\_aline*

---

**Description**

add horizontal align lines layer to a tree

**Usage**

```
geom_aline(mapping = NULL, linetype = "dotted", size = 1, ...)
```

**Arguments**

mapping	aes mapping
linetype	set line type of the line, defaults to "dotted"
size	set line size of the line, defaults to 1
...	additional parameter

**Details**

'geom\_aline' align all tips to the longest one by adding padding characters to the right side of the tip.

**Value**

aline layer

**Author(s)**

Yu Guangchuang

---

geom_balance	geom_balance
--------------	--------------

---

### Description

highlights the two direct descendant clades of an internal node

### Usage

```
geom_balance(  
  node,  
  fill = "steelblue",  
  color = "white",  
  alpha = 0.5,  
  extend = 0,  
  extendto = NULL  
)
```

### Arguments

node	selected node (balance) to highlight its two direct descendant
fill	color to fill in the highlight rectangle, default to "steelblue"
color	color to outline highlight rectangle and divide balance, defaults to "white"
alpha	alpha (transparency) for the highlight rectangle, defaults to 0.5
extend	extend xmax of the highlight rectangle by the value of extend
extendto	extend xmax of the highlight rectangle to the value of extendto

### Details

Particularly useful when studying neighboring clades. Note that balances that correspond to multi-chotomies will not be displayed.

### Value

ggplot2

### Author(s)

Justin Silverman and modified by Guangchuang Yu

### References

J. Silverman, et al. *A phylogenetic transform enhances analysis of compositional microbiota data*. (in preparation)

For more detailed demonstration, please refer to chapter 5.2.2 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**Examples**

```
library(ggtree)
set.seed(123)
tr<- rtree(15)
x <- ggtree(tr)
x + geom_balance(17)
```

---

geom\_cladelab

*geom\_cladelab*


---

**Description**

annotate a clade with bar and text label or (image)

**Usage**

```
geom_cladelab(
  node = NULL,
  label = NULL,
  data = NULL,
  mapping = NULL,
  geom = "text",
  parse = FALSE,
  ...
)
```

**Arguments**

node	selected node to annotate, when data and mapping is NULL, it is required.
label	character, character to be showed, when data and mapping is NULL, it is required.
data	data.frame, the data to be displayed in the annotation, defaults to NULL.
mapping	Set of aesthetic mappings, defaults to NULL. The detail see the following explanation.
geom	character, one of 'text', 'label', 'shadowtext', 'image' and 'phylopic', defaults to 'text', and the parameter see the Aesthetics For Specified Geom.
parse	logical, whether parse label to emoji font, defaults to FALSE.
...	additional parameters, see also following section. additional parameters can refer the following parameters. <ul style="list-style-type: none"> <li>• <code>offset.distance.bar.and.tree</code>, offset of bar and text from the clade, defaults to 0.</li> <li>• <code>offset.text.distance.bar.and.text</code>, offset of text from bar, defaults to 0.</li> <li>• <code>align.logical</code>, whether align clade lab, defaults to FALSE.</li> </ul>

- extend numeric, extend the length of bar, defaults to 0.
- angle numeric or 'auto', if angle is auto, the angle of text will be calculated automatically, which is useful for the circular etc layout, defaults to 0.
- horizontal logical, whether set label to horizontal, defaults to TRUE.
- barsize the width of line, defaults to 0.5.
- barcolour the colour of line, defaults to 'black'.
- fontsize the size of text, defaults to 3.88.
- textcolour the colour of text, defaults to 'black'.
- imagesize the size of image, defaults to 0.05.
- imagecolor the colour of image, defaults to NULL, when geom="phylopic", it should be required.

The parameters also can be set in mapping, when data is provided. Note: the barsize, barcolour, fontsize, textcolour, imagesize and imagecolor should not be set in mapping (aesthetics). When the color and size are not be set in mapping, user can modify them to adjust the attributes of specified geom.

### Aesthetics For Specified Geom

geom\_cladelab() understands the following aesthetics for geom="text"(required aesthetics are in bold):

- **node** selected node to hight light, it is required.
- **label** labels to be shown, it is required.
- colour the colour of text, defaults to "black".
- size the size of text, defaults to 3.88.
- angle the angle of text, defaults to 0.
- hjust A numeric vector specifying horizontal justification, defaults to 0.
- vjust A numeric vector specifying vertical justification, defaults to 0.5.
- alpha the transparency of text, defaults to NA.
- family the family of text, defaults to 'sans'.
- fontface the font face of text, defaults to 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- lineheight The height of a line as a multiple of the size of text, defaults to 1.2 .

when the colour, size are not be set in mapping, and user want to modify the colour of text, they should use textcolour, fontsize to avoid the confusion with bar layer annotation.

geom\_cladelab() understands the following aesthethics for geom="label" (required aesthetics are in bold):

- **node** selected node to hight light, it is required.
- **label** labels to be shown, it is required.
- colour the colour of text, defaults to "black".
- fill the background colour of the label, defaults to "white".
- size the size of text, defaults to 3.88.

- **angle** the angle of text, defaults to 0.
- **hjust** A numeric vector specifying horizontal justification, defaults to 0.
- **vjust** A numeric vector specifying vertical justification, defaults to 0.5.
- **alpha** the transparency of text, defaults to NA.
- **family** the family of text, defaults to 'sans'.
- **fontface** the font face of text, defaults to 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- **lineheight** The height of a line as a multiple of the size of text, defaults to 1.2 .

when the colour, size are not be set in mapping, and user want to modify the colour of text, they should use `textcolour`, `fontsize` to avoid the confusion with bar layer annotation.

`geom_cladelab()` understands the following aesthetics for `geom="shadowtext"` (required aesthetics are in bold):

- **node** selected node to hight light, it is required.
- **label** labels to be shown, it is required.
- **colour** the colour of text, defaults to "black".
- **bg.colour** the background colour of text, defaults to 'black'.
- **bg.r** the width of background text, defaults to 0.1.
- **size** the size of text, defaults to 3.88.
- **angle** the angle of text, defaults to 0.
- **hjust** A numeric vector specifying horizontal justification, defaults to 0.
- **vjust** A numeric vector specifying vertical justification, defaults to 0.5.
- **alpha** the transparency of text, defaults to NA.
- **family** the family of text, defaults to 'sans'.
- **fontface** the font face of text, defaults to 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- **lineheight** The height of a line as a multiple of the size of text, defaults to 1.2 .

when the colour, size are not be set in mapping, and user want to modify the colour of text, they should use `textcolour`, `fontsize` to avoid the confusion with bar layer annotation.

`geom_cladelab()` understands the following aesthetics for `geom="image"` or `geom="phylopic"` (required aesthetics are in bold):

- **node** selected node to hight light, it is required.
- **label** labels to be shown, it is required.
- **image** the image to be annotated, when `geom="phylopic"`, the uid of phylopic databases, it is required.
- **colour** the color of image, defaults to NULL.
- **size** the size of image, defaults to 0.05.
- **alpha** the alpha of image, defaults to 0.8.

when the colour, size are not be set in mapping, and user want to modify the colour of image, they should use `imagecolour`, `imagesize` to avoid the confusion with bar layer annotation.



**Examples**

```

set.seed(2015-12-21)
tree <- rtree(30)
data <- data.frame(id=c(34, 56),
                   annote=c("another clade", "long clade names"),
                   image=c("7fb9bea8-e758-4986-afb2-95a2c3bf983d",
                           "0174801d-15a6-4668-bfe0-4c421fbe51e8"),
                   group=c("A", "B"),
                   offset=c(0.1, 0.1),
                   offset.text=c(0.1, 0.2))

p <- ggtree(tree) + xlim(NA, 6)

p + geom_cladelab(node=45, label="test label") +
  geom_cladelab(node=34, label="another clade")
p2 <- p + geom_cladelab(data=data,
                        mapping=aes(
                          node=id,
                          label=annote,
                          image=image,
                          color=group,
                          offset=offset
                        ),
                        geom="shadowtext",
                        hjust=0.5,
                        align=TRUE,
                        horizontal=FALSE,
                        angle=90,
                        show.legend = FALSE
                      )

p2

```

---

 geom\_cladelabel

*geom\_cladelabel*


---

**Description**

annotate a clade with bar and text label

**Usage**

```

geom_cladelabel(
  node,
  label,
  offset = 0,
  offset.text = 0,
  extend = 0,
  align = FALSE,
  barsize = 0.5,

```

```

    fontsize = 3.88,
    angle = 0,
    geom = "text",
    hjust = 0,
    color = NULL,
    fill = NA,
    family = "sans",
    parse = FALSE,
    horizontal = TRUE,
    ...
  )

```

### Arguments

node	selected node
label	clade label
offset	offset of bar and text from the clade
offset.text	offset of text from bar
extend	extend bar height
align	logical
barsize	size of bar
fontsize	size of text
angle	angle of text
geom	one of 'text' or 'label'
hjust	justify text horizontally
color	color for clade & label, of length 1 or 2
fill	fill label background, only work with geom='label'
family	sans by default, can be any supported font
parse	logical, whether parse label
horizontal	logical, whether set label to horizontal, defaults to TRUE.
...	additional parameter

### Value

ggplot layers

### Author(s)

Guangchuang Yu

### See Also

[geom\\_cladelabel2](#)

---

geom\_cladelabel2      *geom\_cladelabel2*

---

### Description

annotate a clade with bar and text label

### Usage

```
geom_cladelabel2(
  node,
  label,
  offset = 0,
  offset.text = 0,
  offset.bar = 0,
  align = FALSE,
  barsize = 0.5,
  fontsize = 3.88,
  hjust = 0,
  geom = "text",
  color = NULL,
  family = "sans",
  parse = FALSE,
  horizontal = TRUE,
  ...
)
```

### Arguments

node	selected node
label	clade label
offset	offset of bar and text from the clade
offset.text	offset of text from bar
offset.bar	offset of bar from text
align	logical
barsize	size of bar
fontsize	size of text
hjust	justify text horizontally
geom	one of 'text' or 'label'
color	color for clade & label, of length 1 or 2
family	sans by default, can be any supported font
parse	logical, whether parse label
horizontal	logical, whether set label to horizontal, defaults to TRUE.
...	additional parameter

**Value**

ggplot layers

**Author(s)**

JustGitting

**See Also**

[geom\\_cladelabel](#)

---

geom\_highlight

*geom\_highlight*

---

**Description**

layer of highlight clade

**Usage**

```
geom_highlight(  
  data = NULL,  
  mapping = NULL,  
  node = NULL,  
  type = "auto",  
  to.bottom = FALSE,  
  ...  
)
```

```
geom_highlight(  
  data = NULL,  
  mapping = NULL,  
  node = NULL,  
  type = "auto",  
  to.bottom = FALSE,  
  ...  
)
```

**Arguments**

data	data.frame, The data to be displayed in this layer, defaults to NULL.
mapping	Set of aesthetic mappings, defaults to NULL.
node	selected node to highlight, when data and mapping is NULL, it is required.

type	the type of layer, defaults to auto, meaning rectangular, circular, slanted, fan, inward_circular, radial, equal_angle, ape layout tree will use rectangular layer, unrooted and daylight layout tree use will use encircle layer. You can specify this parameter to rect (rectangular layer) or encircle (encircle layer), 'gradient' (gradient color), 'roundrect' (round rectangular layer).
to.bottom	logical, whether set the high light layer to the bottom in all layers of 'ggtree' object, default is FALSE.
...	additional parameters, see also the below and Aesthetics section. <ul style="list-style-type: none"> <li>align control the align direction of the edge of high light rectangular. Options is 'none' (default), 'left', 'right', 'both'. This argument only work when the 'geom_highlight' is plotting using geom_highlight(mapping=aes(...)).</li> <li>gradient.direction character, the direction of gradient color, defaults to 'rt' meaning the locations of gradient color is from root to tip, options are 'rt' and 'tr'.</li> <li>gradient.length.out integer, desired length of the sequence of gradient color, defaults to 2.</li> <li>roundrect.r numeric, the radius of the rounded corners, when roundrect=TRUE, defaults to 0.05.</li> </ul>

### Details

geom\_highlight supports data.frame as input. And aesthetics of layer can be mapped. you can see the Aesthetics section to set parameters.

### Value

a list object.

### Aesthetics

geom\_highlight() understands the following aesthetics for rectangular layer (required aesthetics are in bold):

- **node** selected node to hight light, it is required.
- colour the colour of margin, defaults to NA.
- fill the colour of fill, defaults to 'steelblue'.
- alpha the transparency of fill, defaults to 0.5.
- extend extend xmax of the rectangle, defaults to 0.
- extendto specify a value, meaning the rectangle extend to, defaults to NULL.
- linetype the line type of margin, defaults to 1.
- size the width of line of margin, defaults to 0.5.

geom\_highlight() understands the following aesthetics for encircle layer (required aesthetics are in bold):

- **node** selected node to hight light, it is required.

- colour the colour of margin, defaults to 'black'.
- fill the colour of fill, defaults to 'steelblue'.
- alpha the transparency of fill, defaults to 0.5.
- expand expands the xspline clade region, defaults to 0.
- spread control the size, when only one point.
- size the width of line of margin, defaults to 0.5.
- linetype the line type of margin, defaults to 1.
- s\_shape the shape of the spline relative to the control points, defaults to 0.5.
- s\_open whether the spline is a line or a closed shape, defaults to FALSE.

### Author(s)

Guangchuang Yu and Shuangbin Xu

### References

For more detailed demonstration, please refer to chapter 5.2.2 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

### Examples

```
library(ggplot2)
set.seed(102)
tree <- rtree(60)
p <- ggtree(tree)
p1 <- p + geom_highlight(node=62) + geom_highlight(node=88, fill="red")
p1
dat <- data.frame(id=c(62, 88), type=c("A", "B"))
p2 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type))
p2
p3 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type), align="left")
p4 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type), align="right")
p5 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type), align="both")
# display the high light layer with gradiental color rectangular.
p6 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type), type = "gradient", alpha=0.68)
p7 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type), type = "gradient", gradient.direction="tr", alpha=0.68)
# display the high light layer with round rectangular.
p8 <- p + geom_highlight(data=dat, mapping=aes(node=id, fill=type), type = "roundrect", alpha=0.68)
p2/ p3/ p4/ p5 / p6/ p7/ p8
```

---

`geom_inset`*geom\_inset*

---

## Description

`geom_inset` can add subplots to tree by accepting a list of ggplot objects that are ancestral stats or data associated with selected nodes in the tree. These ggplot objects can be any kind of charts or hybrid of of these charts.

add subplots as insets in a tree

## Usage

```
geom_inset(  
  insets,  
  width = 0.1,  
  height = 0.1,  
  hjust = 0,  
  vjust = 0,  
  x = "node",  
  reverse_x = FALSE,  
  reverse_y = FALSE  
)
```

```
inset(  
  tree_view,  
  insets,  
  width,  
  height,  
  hjust = 0,  
  vjust = 0,  
  x = "node",  
  reverse_x = FALSE,  
  reverse_y = FALSE  
)
```

## Arguments

<code>insets</code>	a list of ggplot objects, named by node number
<code>width</code>	width of the inset, relative to the range of x-axis, defaults to .1
<code>height</code>	height of the inset, relative to the range of y-axis, defaults to .1
<code>hjust</code>	adjust the horizontal position of the charts, charts will go left if <code>hjust &gt; 0</code>
<code>vjust</code>	adjust the vertical position of the charts, charts will go down if <code>vjust &gt; 0</code>
<code>x</code>	the position where users want to place the charts, one of 'node' (default) and 'branch'

reverse_x	whether to reverse x axis of the charts by 'ggplot2::scale_x_reverse', defaults to 'FALSE'
reverse_y	whether to reverse y axis of the charts by 'ggplot2::scale_y_reverse', defaults to 'FALSE'
tree_view	tree view

### Details

Users can also use

### Value

inset layer  
tree view with insets

### Author(s)

Guangchuang Yu

### References

For demonstration of this function, please refer to chapter 8.3 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

geom_label2	<i>geom_label2</i>
-------------	--------------------

---

### Description

geom\_label2 support aes(subset) via setup\_data

### Usage

```
geom_label2(  
  mapping = NULL,  
  data = NULL,  
  ...,  
  stat = "identity",  
  position = "identity",  
  family = "sans",  
  parse = FALSE,  
  nudge_x = 0,  
  nudge_y = 0,  
  label.padding = unit(0.25, "lines"),  
  label.r = unit(0.15, "lines"),  
  label.size = 0.25,
```



```

na.rm = TRUE,
show.legend = NA,
inherit.aes = TRUE
)

```

### Arguments

mapping	Set of aesthetic mappings, defaults to NULL.
data	A layer specific dataset - only needed if you want to override the plot defaults.
...	other arguments passed on to 'layer'.
stat	Name of the stat to modify data.
position	The position adjustment to use for overlapping points on this layer.
family	"sans" by default, can be any supported font.
parse	if 'TRUE', the labels will be parsed as expressions, defaults to 'FALSE'.
nudge_x	adjust the horizontal position of the labels.
nudge_y	adjust the vertical position of the labels.
label.padding	Amount of padding around label, defaults to 'unit(0.25, "lines")'.
label.r	Use to set the radius of rounded corners of the label, defaults to 'unit(0.15, "lines")'.
label.size	Size of label border, in mm, defaults to 0.25.
na.rm	If "FALSE" (default), missing values are removed with a warning. If "TRUE", missing values are silently removed, logical.
show.legend	Whether to show legend, logical, defaults to "NA".
inherit.aes	Whether to inherit aesthetic mappings, logical, defaults to "TRUE".

### Details

'geom\_label2' is a modified version of geom\_label, with subset aesthetic supported

### Value

label layer

### Author(s)

Guangchuang Yu

### References

For more detailed demonstration of this function, please refer to chapter A.4.5 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

### See Also

[geom\\_label](#)

**Examples**

```
library(ggtree)
set.seed(123)
tr<- rtree(15)
x <- ggtree(tr)
x + geom_label2(aes(label = node, subset = isTip == FALSE))
```

---

geom\_motif

*geom\_motif*

---

**Description**

geom layer to draw aligned motif

**Usage**

```
geom_motif(mapping, data, on, label, align = "centre", ...)
```

**Arguments**

mapping	aes mapping
data	data
on	gene to center (i.e. set middle position of the on gene to 0)
label	specify a column to be used to label genes
align	where to place gene label, default is 'centre' and can be set to 'left' and 'right'
...	additional parameters

**Value**

geom layer

**Author(s)**

Guangchuang Yu

---

geom_nodelab	<i>geom_nodelab</i>
--------------	---------------------

---

## Description

add node label layer for a tree

## Usage

```
geom_nodelab(  
  mapping = NULL,  
  nudge_x = 0,  
  nudge_y = 0,  
  geom = "text",  
  hjust = 0.5,  
  node = "internal",  
  ...  
)
```

## Arguments

mapping	aesthetic mappings, defaults to NULL
nudge_x	horizontal adjustment to nudge labels, defaults to 0
nudge_y	vertical adjustment to nudge labels, defaults to 0
geom	one of 'text', 'shadowtext', 'label', 'image' and 'phylopic'
hjust	horizontal alignment, defaults to 0.5
node	a character indicating which node labels will be displayed, it should be one of 'internal', 'external' and 'all'. If it is set to 'internal' will display internal node labels, 'external' will display the tip labels, and 'all' will display internal node and tip labels.
...	additional parameters, see also the additional parameters of <a href="#">geom_tiplab()</a> .

## Value

geom layer

## Author(s)

Guangchuang Yu

## References

For demonstration of this function, please refer to chapter A.4.5 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**See Also**

[geom\\_tiplab\(\)](#)

---

geom\_nodelab2

*geom\_nodelab2*

---

**Description**

add node label for circular layout

**Usage**

```
geom_nodelab2(  
  mapping = NULL,  
  nudge_x = 0,  
  nudge_y = 0,  
  geom = "text",  
  hjust = 0.5,  
  ...  
)
```

**Arguments**

mapping	aesthetic mappings, defaults to NULL
nudge_x	horizontal adjustment to nudge labels, defaults to 0
nudge_y	vertical adjustment to nudge labels, defaults to 0
geom	one of 'text', 'shadowtext', 'label', 'image' and 'phylopic'
hjust	horizontal alignment, defaults to 0.5
...	additional parameters, see also the additional parameters of <a href="#">geom_tiplab()</a> .

**Value**

node label layer

**Author(s)**

Guangchuang Yu

---

geom\_nodepoint      *geom\_nodepoint*

---

### Description

add node point layer to a tree

### Usage

```
geom_nodepoint(
  mapping = NULL,
  data = NULL,
  position = "identity",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE,
  ...
)
```

### Arguments

mapping	Set of aesthetic mapping created by <code>aes()</code> . If <code>inherit.aes = TRUE</code> , the mapping can be inherited from the plot mapping as specified in the call to <code>ggplot()</code> .
data	The data to be displayed in this layer. If 'NULL' (the default), the data is inherited from the plot data as specified in the call to <code>ggplot()</code> .
position	Position adjustment.
na.rm	logical. If 'FALSE' (default), missing values are removed with a warning. If 'TRUE', missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? 'NA', the default, includes if any aesthetics are mapped. 'FALSE' never includes, and 'TRUE' always includes.
inherit.aes	logical (defaults to 'TRUE'). If 'FALSE', overrides the default aesthetics, rather than combining with them.
...	additional parameters that passed on to this layer. These are often aesthetics, used to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code> .

### Value

node point layer

### Author(s)

Guangchuang Yu `library(ggtree) tr<- rtree(15) x <- ggtree(tr) x + geom_nodepoint()`

## References

For more detailed demonstration, please refer to chapter 4.3.2 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

geom\_point2

*geom\_point2*

---

## Description

geom\_point2 is a modified version of geom\_point that supports aes(subset)

## Usage

```
geom_point2(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE,
  ...
)
```

## Arguments

mapping	Set of aesthetic mapping created by aes(). If inherit.aes = TRUE, the mapping can be inherited from the plot mapping as specified in the call to ggplot().
data	The data to be displayed in this layer. If 'NULL' (the default), the data is inherited from the plot data as specified in the call to ggplot().
stat	Name of the statistical transformation to be used on the data for this layer.
position	Position adjustment.
na.rm	logical. If 'FALSE' (default), missing values are removed with a warning. If 'TRUE', missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? 'NA', the default, includes if any aesthetics are mapped. 'FALSE' never includes, and 'TRUE' always includes.
inherit.aes	logical (defaults to 'TRUE'). If 'FALSE', overrides the default aesthetics, rather than combining with them.
...	additional parameters that passed on to this layer. These are often aesthetics, used to set an aesthetic to a fixed value, like colour = "red" or size = 3.

## Details

geom\_point2 creates scatterplots, just similar to ggplot2::geom\_point. It extends the ggplot2::geom\_point to support filtering via the subset aesthetic mapping (see Aesthetics section).

## Value

point layer

## Aesthetics

geom\_point2() understands the following aesthetics

- subset logical expression indicating elements or rows to keep: missing values are taken as false; should be in aes().
- colour the colour of point, defaults to "black".
- fill the colour of fill, defaults to "black".
- alpha the transparency of fill, defaults to 1.
- size the size of point, defaults to 1.5.
- shape specify a shape, defaults to 19.
- stroke control point border thickness of point, defaults to 0.5.

## Author(s)

Guangchuang Yu

## References

1. G Yu, DK Smith, H Zhu, Y Guan, TTY Lam (2017). ggtree: an R package for visualization and annotation of phylogenetic trees with their covariates and other associated data. *Methods in Ecology and Evolution*, 8(1):28-36. <https://doi.org/10.1111/2041-210X.12628>
2. G Yu\*, TTY Lam, H Zhu, Y Guan\*. Two methods for mapping and visualizing associated data on phylogeny using ggtree. *Molecular Biology and Evolution*, 2018, 35(2):3041-3043. <https://doi.org/10.1093/molbev/msy194>
3. G Yu. Using ggtree to visualize data on tree-like structures. *Current Protocols in Bioinformatics*, 2020, 69:e96. <https://doi.org/10.1002/cpbi.96>

For more information about tree visualization, please refer to the online book <https://yulab-smu.top/treedata-book/>

## See Also

[geom\\_point](#); [geom\\_rootpoint](#) add point of root; [geom\\_nodepoint](#) add points of internal nodes; [geom\\_tippoint](#) add points of external nodes (also known as tips or leaves).

**Examples**

```

library(ggtree)
## add point by aes(subset)
tr <- rtree(10)
# group tip and node
ggtree(tr) + geom_point2(aes(shape=isTip, color=isTip), size=3)
# specify a node to display
ggtree(tr) + geom_point2(aes(subset=(node==15)), shape=21, size=5, fill='green')
# specify a tip to display
ggtree(tr) + geom_point2(aes(subset=(label %in% c("t1", "t3"))), shape=21, size=5, fill='green')

## color point with continuous variables
library(ggtree)
library(treeio)
library(ggplot2)
beast_file <- system.file("examples/MCC_FluA_H3.tree", package="ggtree")
beast_tree <- read.beast(beast_file)
p <- ggtree(beast_tree) +
  geom_tiplab(hjust = -.1)+
  geom_nodepoint(aes(fill = rate), shape = 21, size = 4) +
  scale_fill_continuous(low = 'blue', high = 'red') +
  theme_tree2() + theme(legend.position = 'right')
p

```

---

**geom\_range***geom\_range*

---

**Description**

horizontal bar of range (HPD, range etc) on nodes to present uncertainty of evolutionary inference

**Usage**

```
geom_range(range, center = "auto", ...)
```

**Arguments**

range	range(interval) to be displayed, e.g. "height_0.95_HPD"
center	center of the range, mean, median or auto (default, the center of the range)
...	additional parameter, e.g. color, size, alpha

**Value**

ggplot layer

**Author(s)**

Guangchuang Yu



## References

For demonstration of this function, please refer to chapter 5.2.4 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

geom_rootedge	<i>geom_rootedge</i>
---------------	----------------------

---

## Description

display root edge layer for a tree

## Usage

```
geom_rootedge(rootedge = NULL, ...)
```

## Arguments

rootedge	length of rootedge; use phylo\$root.edge if rootedge = NULL (default).
...	additional parameters

Additional parameters can be referred to the following parameters:

- size control the width of rootedge, defaults to 0.5.
- colour color of rootedge, defaults to black.
- linetype the type of line, defaults to 1.
- alpha modify colour transparency, defaults to 1.

## Details

geom\_rootedge is used to create a rootedge as ggtree doesn't plot the root edge by default.

## Value

ggtree rootedge layer

## Author(s)

Guangchuang Yu

## References

1. G Yu, DK Smith, H Zhu, Y Guan, TTY Lam (2017). ggtree: an R package for visualization and annotation of phylogenetic trees with their covariates and other associated data. *Methods in Ecology and Evolution*, 8(1):28-36. <https://doi.org/10.1111/2041-210X.12628>

**Examples**

```

library(ggtree)
set.seed(123)
## with root edge = 1
tree1 <- read.tree(text='((A:1,B:2):3,C:2):1;')
ggtree(tree1) + geom_tiplab() + geom_rootedge()

## without root edge
tree2 <- read.tree(text='((A:1,B:2):3,C:2);')
ggtree(tree2) + geom_tiplab() + geom_rootedge()

## setting root edge
tree2$root.edge <- 2
ggtree(tree2) + geom_tiplab() + geom_rootedge()

## specify length of root edge for just plotting
## this will ignore tree$root.edge
ggtree(tree2) + geom_tiplab() + geom_rootedge(rootedge = 3)

## For more detailed demonstration of this function, please refer to chapter A.4.5 of
## *Data Integration, Manipulation and Visualization of Phylogenetic Trees*
## <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

```

---

geom\_rootpoint      *geom\_rootpoint*

---

**Description**

geom\_rootpoint is used to add root point layer to a tree

**Usage**

```

geom_rootpoint(
  mapping = NULL,
  data = NULL,
  position = "identity",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE,
  ...
)

```

**Arguments**

mapping      Set of aesthetic mapping created by aes(). If inherit.aes = TRUE, the mapping can be inherited from the plot mapping as specified in the call to ggplot().

data	The data to be displayed in this layer. If 'NULL' (the default), the data is inherited from the plot data as specified in the call to <code>ggplot()</code> .
position	Position adjustment.
na.rm	logical. If 'FALSE' (default), missing values are removed with a warning. If 'TRUE', missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? 'NA', the default, includes if any aesthetics are mapped. 'FALSE' never includes, and 'TRUE' always includes.
inherit.aes	logical (defaults to 'TRUE'). If 'FALSE', overrides the default aesthetics, rather than combining with them.
...	additional parameters that passed on to this layer. These are often aesthetics, used to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code> .

### Details

`geom_rootpoint` inherit from `geom_point2`, and it is used to display and customize the points on the root

### Value

root point layer

### Author(s)

Guangchuang Yu

### References

1. Guangchuang Yu. Using `ggtree` to visualize data on tree-like structures. *Current Protocols in Bioinformatics*. 2020, 69:e96. doi:10.1002/cpbi.96
2. Guangchuang Yu, Tommy Tsan-Yuk Lam, Huachen Zhu, Yi Guan. Two methods for mapping and visualizing associated data on phylogeny using `ggtree`. *Molecular Biology and Evolution*. 2018, 35(12):3041-3043. doi:10.1093/molbev/msy194
3. Guangchuang Yu, David Smith, Huachen Zhu, Yi Guan, Tommy Tsan-Yuk Lam. `ggtree`: an R package for visualization and annotation of phylogenetic trees with their covariates and other associated data. *Methods in Ecology and Evolution*. 2017, 8(1):28-36. doi:10.1111/2041-210X.12628

For more information, please refer to the online book: *Data Integration, Manipulation and Visualization of Phylogenetic Trees*. <http://yulab-smu.top/treedata-book/>

### See Also

[geom\\_point](#); [geom\\_rootpoint](#) add point of root; [geom\\_nodepoint](#) add points of internal nodes; [geom\\_tippoint](#) add points of external nodes (also known as tips or leaves).

**Examples**

```
library(ggtree)
tr <- rtree(10)
## add root point
ggtree(tr) + geom_rootpoint()
ggtree(tr) + geom_rootpoint(size=2,color="red",shape=2)
```

---

 geom\_segment2

*geom\_segment2*


---

**Description**

geom\_segment2 support aes(subset) via setup\_data

**Usage**

```
geom_segment2(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  lineend = "butt",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE,
  nudge_x = 0,
  arrow = NULL,
  arrow.fill = NULL,
  ...
)
```

**Arguments**

mapping	Set of aesthetic mappings, defaults to NULL
data	A layer specific dataset - only needed if you want to override the plot defaults.
stat	Name of stat to modify data.
position	The position adjustment to use for overlapping points on this layer.
lineend	Line end style, one of butt (default), round and square.
na.rm	If "FALSE" (default), missing values are removed with a warning. If "TRUE", missing values are silently removed, logical.
show.legend	Whether to show legend, logical.
inherit.aes	Whether to inherit aesthetic mappings, logical, defaults to "TRUE".
nudge_x	adjust the horizontal position of the segments.
arrow	specification for arrow heads, as created by arrow().
arrow.fill	fill color to usse for the arrow head (if closed). NULL means use colour aesthetic.
...	additional parameter

**Details**

'geom\_segment2' is a modified version of geom\_segment, with subset aesthetic supported

**Value**

add segment layer

**Author(s)**

Guangchuang Yu

**See Also**

[geom\\_segment](#)

---

geom\_strip

*geom\_strip*

---

**Description**

annotate associated taxa (from taxa1 to taxa2, can be Monophyletic, Polyphyletic or Paraphyletic Taxa) with bar and (optional) text label

**Usage**

```
geom_strip(  
  taxa1,  
  taxa2,  
  label,  
  offset = 0,  
  offset.text = 0,  
  align = TRUE,  
  barsize = 0.5,  
  extend = 0,  
  fontsize = 3.88,  
  angle = 0,  
  geom = "text",  
  hjust = 0,  
  color = "black",  
  fill = NA,  
  family = "sans",  
  parse = FALSE,  
  ...  
)
```

**Arguments**

taxa1	taxa1
taxa2	taxa2
label	add label alongside the bar (optional)
offset	offset of bar and text from the clade
offset.text	offset of text from bar
align	logical, whether to align bars to the most distant bar ,defaults to "TRUE" Note that if "FALSE", the bars might cross the tree
barsize	set size of the bar
extend	extend bar length vertically
fontsize	set size of the text
angle	set the angle of text
geom	one of 'text' or 'label'
hjust	adjust the horizontal position of the bar
color	set color for bar and label
fill	set color to fill label background, only work with geom='label'
family	"sans" by default, can be any supported font
parse	logical, whether to parse labels, if "TRUE", the labels will be parsed into expressions, defaults to "FALSE"
...	additional parameter

**Value**

ggplot layers

**Author(s)**

Guangchuang Yu

**References**

For more detailed demonstration of this function, please refer to chapter 5.2.1 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**Examples**

```
library(ggtree)
tr<- rtree(15)
x <- ggtree(tr)
x + geom_strip(13, 1, color = "red") + geom_strip(3, 7, color = "blue")
```

---

<code>geom_striplab</code>	<i>geom_striplab</i>
----------------------------	----------------------

---

### Description

annotate associated taxa (from `taxa1` to `taxa2`, can be Monophyletic, Polyphyletic or Paraphyletic Taxa) with bar and (optional) text label or image

### Usage

```
geom_striplab(
  taxa1 = NULL,
  taxa2 = NULL,
  label = NULL,
  data = NULL,
  mapping = NULL,
  geom = "text",
  parse = FALSE,
  ...
)
```

### Arguments

<code>taxa1</code>	can be label or node number
<code>taxa2</code>	can be label or node number
<code>label</code>	character, character to be showed, when data and mapping is NULL, it is required.
<code>data</code>	data.frame, the data to be displayed in the annotation, default is NULL.
<code>mapping</code>	Set of aesthetic mappings, default is NULL. The detail see the following explanation.
<code>geom</code>	character, one of 'text', 'label', 'shadowtext', 'image' and 'phylopic', default is 'text', and the parameter see the Aesthetics For Specified Geom.
<code>parse</code>	logical, whether parse label to emoji font, default is FALSE.
<code>...</code>	additional parameters, see also following section. additional parameters can refer the following parameters. <code>##</code> <ul style="list-style-type: none"> <li>• <code>offset</code> distance bar and tree, offset of bar and text from the clade, default is 0.</li> <li>• <code>offset.text</code> distance bar and text, offset of text from bar, default is 0.</li> <li>• <code>align</code> logical, whether align clade lab, default is FALSE.</li> <li>• <code>extend</code> numeric, extend the length of bar, default is 0.</li> <li>• <code>angle</code> numeric or 'auto', if angle is auto, the angle of text will be calculated automatically, which is useful for the circular etc layout, default is 0.</li> <li>• <code>horizontal</code> logical, whether set label to horizontal, default is TRUE.</li> </ul>

- `barsize` the width of line, default is 0.5.
- `barcolour` the colour of line, default is 'black'.
- `fontsize` the size of text, default is 3.88.
- `textcolour` the colour of text, default is 'black'.
- `imagesize` the size of image, default is 0.05.
- `imagecolor` the colour of image, default is NULL, when `geom="phylopic"`, it should be required.

The parameters also can be set in mapping, when data is provided. Note: the `barsize`, `barcolour`, `fontsize`, `textcolour`, `imagesize` and `imagecolor` should not be set in mapping (aesthetics). When the color and size are not be set in mapping, user can modify them to adjust the attributes of specified geom.

### Aesthetics For Specified Geom

`geom_striplab()` understands the following aesthetics for `geom="text"` (required aesthetics are in bold):

- **taxa1** selected tip label or tip node, it is required.
- **taxa2** selected another tip label or tip node, it is required.
- **label** labels to be shown, it is required.
- **colour** the colour of text, default is "black".
- **size** the size of text, default is 3.88.
- **angle** the angle of text, default is 0.
- **hjust** A numeric vector specifying horizontal justification, default is 0.
- **vjust** A numeric vector specifying vertical justification, default is 0.5.
- **alpha** the transparency of text, default is NA.
- **family** the family of text, default is 'sans'.
- **fontface** the font face of text, default is 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- **lineheight** The height of a line as a multiple of the size of text, default is 1.2 .

when the colour, size are not be set in mapping, and user want to modify the colour of text, they should use `textcolour`, `fontsize` to avoid the confusion with bar layer annotation.

`geom_striplab()` understands the following aesthetics for `geom="label"` (required aesthetics are in bold):

- **taxa1** selected node to high light, it is required.
- **taxa2** selected another tip label or tip node, it is required.
- **label** labels to be shown, it is required.
- **colour** the colour of text, default is "black".
- **fill** the background colour of the label, default is "white".
- **size** the size of text, default is 3.88.
- **angle** the angle of text, default is 0.
- **hjust** A numeric vector specifying horizontal justification, default is 0.



- `vjust` A numeric vector specifying vertical justification, default is 0.5.
- `alpha` the transparency of text, default is NA.
- `family` the family of text, default is 'sans'.
- `fontface` the font face of text, default is 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- `lineheight` The height of a line as a multiple of the size of text, default is 1.2 .

when the colour, size are not be set in mapping, and user want to modify the colour of text, they should use `textcolour`, `fontsize` to avoid the confusion with bar layer annotation.

`geom_striplab()` understands the following aesthetics for `geom="shadowtext"` (required aesthetics are in bold):

- `taxa1` selected node to hight light, it is required.
- `taxa2` selected another tip label or tip node, it is required.
- `label` labels to be shown, it is required.
- `colour` the colour of text, default is "black".
- `bg.colour` the background colour of text, default is 'black'.
- `bg.r` the width of background text, default is 0.1.
- `size` the size of text, default is 3.88.
- `angle` the angle of text, default is 0.
- `hjust` A numeric vector specifying horizontal justification, default is 0.
- `vjust` A numeric vector specifying vertical justification, default is 0.5.
- `alpha` the transparency of text, default is NA.
- `family` the family of text, default is 'sans'.
- `fontface` the font face of text, default is 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- `lineheight` The height of a line as a multiple of the size of text, default is 1.2 .

when the colour, size are not be set in mapping, and user want to modify the colour of text, they should use `textcolour`, `fontsize` to avoid the confusion with bar layer annotation.

`geom_striplab()` understands the following aesthetics for `geom="image"` or `geom="phylopic"` (required aesthetics are in bold):

- `taxa1` selected node to hight light, it is required.
- `taxa2` selected another tip label or tip node, it is required.
- `label` labels to be shown, it is required.
- `image` the image to be annotated, when `geom="phylopic"`, the uid of phylopic databases, it is required.
- `colour` the color of image, default is NULL.
- `size` the size of image, default is 0.05.
- `alpha` the alpha of image, default is 0.8.

when the colour, size are not be set in mapping, and user want to modify the colour of image, they should use `imagecolour`, `imagesize` to avoid the confusion with bar layer annotation.

**Examples**

```

set.seed(123)
tr <- rtree(10)
dt <- data.frame(ta1=c("t5", "t1"), ta2=c("t6", "t3"), group=c("A", "B"))
p <- ggtree(tr) + geom_tiplab()
p2 <- p +
  geom_striplab(
    data = dt,
    mapping = aes(taxa1 = ta1, taxa2 = ta2,
                  label = group, color=group),
    align = TRUE,
    show.legend = FALSE
  )
p2

```

---

geom\_taxalink

*link between taxa*


---

**Description**

geom\_taxalink supports data.frame as input, the colour, size, linetype and alpha can be mapped. When the data was provided, the mapping should be also provided, which taxa1 and taxa2 should be mapped created by aes, aes\_ or aes\_string. In addition, the hratio, control the height of curve line, when tree layout is circular, default is 1. ncp, the number of control points used to draw the curve, more control points creates a smoother curve, default is 1. They also can be mapped to a column of data.

**Usage**

```

geom_taxalink(
  data = NULL,
  mapping = NULL,
  taxa1 = NULL,
  taxa2 = NULL,
  offset = NULL,
  outward = "auto",
  ...
)

```

**Arguments**

data	data.frame, The data to be displayed in this layer, default is NULL.
mapping	Set of aesthetic mappings, default is NULL.
taxa1	can be label or node number.
taxa2	can be label or node number.
offset	numeric, control the shift of curve line (the ratio of axis value, range is "(0-1)"), default is NULL.

outward            logical, control the orientation of curve when the layout of tree is circular, fan or other layout in polar coordinate, default is "auto", meaning It will automatically.  
 ...,                additional parameter.

**Value**

a list object.

**Aesthetics**

geom\_taxalink() understands the following aesthetics (required aesthetics are in bold):

- taxa1 label or node number of tree.
- taxa2 label or node number of tree.
- group group category of link.
- colour control the color of line, default is black.
- linetype control the type of line, default is 1 (solid).
- size control the width of line, default is 0.5.
- curvature control the curvature of line, default is 0.5, it will be created automatically in polar coordinate .
- hratio control the height of curve line, default is 1.
- ncp control the smooth of curve line, default is 1.

---

geom\_text2

*geom\_text2*

---

**Description**

geom\_text2 support aes(subset) via setup\_data

**Usage**

```
geom_text2(
  mapping = NULL,
  data = NULL,
  ...,
  stat = "identity",
  position = "identity",
  family = "sans",
  parse = FALSE,
  na.rm = TRUE,
  show.legend = NA,
  inherit.aes = TRUE,
  nudge_x = 0,
  nudge_y = 0,
  check_overlap = FALSE
)
```

**Arguments**

mapping	the aesthetic mapping
data	A layer specific dataset - only needed if you want to override the plot defaults.
...	other arguments passed on to 'layer'
stat	Name of stat to modify data
position	The position adjustment to use for overlapping points on this layer
family	sans by default, can be any supported font
parse	if TRUE, the labels will be passed into expressions
na.rm	logical
show.legend	logical
inherit.aes	logical
nudge_x	horizontal adjustment
nudge_y	vertical adjustment
check_overlap	if TRUE, text that overlaps previous text in the same layer will not be plotted

**Value**

text layer

**Author(s)**

Guangchuang Yu

**See Also**

[geom\\_text](#)

---

geom\_tiplab

*geom\_tiplab*

---

**Description**

add tip label layer for a tree

**Usage**

```
geom_tiplab(
  mapping = NULL,
  hjust = 0,
  align = FALSE,
  linetype = "dotted",
  linesize = 0.5,
  geom = "text",
  offset = 0,
  as_ylab = FALSE,
  ...
)
```

**Arguments**

mapping	aes mapping
hjust	horizontal adjustment, defaults to 0
align	if TRUE, align all tip labels to the longest tip by adding padding characters to the left side of tip labels, defaults to "FALSE" with a line connecting each tip and its corresponding label, defaults to "FALSE"
linetype	set linetype of the line if align = TRUE, defaults to "dotted"
linesize	set line size of the line if align = TRUE, defaults to 0.5
geom	one of 'text', 'label', 'shadowtext', 'image' and 'phylopic'
offset	tiplab offset, horizontal adjustment to nudge tip labels, defaults to 0
as_ylab	display tip labels as y-axis label, only works for rectangular and dendrogram layouts, defaults to "FALSE"
...	additional parameter

additional parameters can refer the following parameters.

The following parameters for geom="text".

- size control the size of tip labels, defaults to 3.88.
- colour control the colour of tip labels, defaults to "black".
- angle control the angle of tip labels, defaults to 0.
- vjust A numeric vector specifying vertical justification, defaults to 0.5.
- alpha the transparency of text, defaults to NA.
- family the family of text, defaults to 'sans'.
- fontface the font face of text, defaults to 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- lineheight The height of a line as a multiple of the size of text, defaults to 1.2 .
- nudge\_x horizontal adjustment to nudge labels, defaults to 0.
- nudge\_y vertical adjustment to nudge labels, defaults to 0.
- check.overlap if TRUE, text that overlaps previous text in the same layer will not be plotted.
- parse if TRUE, the labels will be parsed into expressions, if it is 'emoji', the labels will be parsed into emoji font.

The following parameters for geom="label".

- size the size of tip labels, defaults to 3.88.
- colour the colour of tip labels, defaults to "black".
- fill the colour of rectangular box of labels, defaults to "white".
- vjust numeric vector specifying vertical justification, defaults to 0.5.
- alpha the transparency of labels, defaults to NA.
- family the family of text, defaults to 'sans'.
- fontface the font face of text, defaults to 1 (plain), others are 2 (bold), 3 (italic), 4 (bold.italic).
- lineheight The height of a line as a multiple of the size of text, defaults to 1.2.

- `nudge_x` horizontal adjustment to nudge labels, defaults to 0.
- `nudge_y` vertical adjustment, defaults to 0.
- `check_overlap` if TRUE, text that overlaps previous text in the same layer will not be plotted.
- `parse` if TRUE, the labels will be parsed into expressions, if it is 'emoji', the labels will be parsed into emoji font.
- `label.padding` Amount of padding around label, defaults to 'unit(0.25, "lines")'.
- `label.r` Radius of rounded corners, defaults to 'unit(0.15, "lines")'.
- `label.size` Size of label border, in mm, defaults to 0.25.

The following parameters for `geom="shadowtext"`, some parameters are like to `geom="text"`.

- `bg.colour` the background colour of text, defaults to "black".
- `bg.r` the width of background of text, defaults to 0.1 .

The following parameters for `geom="image"` or `geom="phylopic"`.

- `image` the image file path for `geom='image'`, but when `geom='phylopic'`, it should be the uid of phylopic databases.
- `size` the image size, defaults to 0.05.
- `colour` the color of image, defaults to NULL.
- `alpha` the transparency of image, defaults to 0.8.

The following parameters for the line when `align = TRUE`.

- `colour` the colour of line, defaults to 'black'.
- `alpha` the transparency of line, defaults to NA.
- `arrow` specification for arrow heads, as created by `arrow()`, defaults to NULL.
- `arrow.fill` fill color to use for the arrow head (if closed), defaults to 'NULL', meaning use 'colour' aesthetic.

## Details

'geom\_tiplab' not only supports using text or label geom to display tip labels, but also supports image geom to label tip with image files or phylopics.

For adding tip labels to a tree with circular layout, 'geom\_tiplab' will automatically adjust the angle of the tip labels to the tree by internally calling 'geom\_tiplab2'.

## Value

tip label layer

## Author(s)

Guangchuang Yu

## References

For more detailed demonstration, please refer to chapter 4.3.3 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**Examples**

```
require(ape)
tr <- rtree(10)
ggtree(tr) + geom_tiplab()
```

---

geom_tiplab2	<i>geom_tiplab2</i>
--------------	---------------------

---

**Description**

add tip label for circular layout

**Usage**

```
geom_tiplab2(mapping = NULL, hjust = 0, ...)
```

**Arguments**

mapping	aes mapping
hjust	horizontal adjustment, defaults to 0
...	additional parameter, see geom_tiplab

**Details**

'geom\_tiplab2' will automatically adjust the angle of the tip labels to the tree with circular layout

**Value**

tip label layer

**Author(s)**

Guangchuang Yu

**References**

<https://groups.google.com/forum/#!topic/bioc-ggtree/o35PV3iH0-0>

**See Also**

[geom\\_tiplab](#)

**Examples**

```
library(ggtree)
set.seed(123)
tr <- rtree(10)
ggtree(tr, layout = "circular") + geom_tiplab2()
```

---

geom\_tippoint            *geom\_tippoint*

---

### Description

add tip point layer for a tree

### Usage

```
geom_tippoint(  
  mapping = NULL,  
  data = NULL,  
  position = "identity",  
  na.rm = FALSE,  
  show.legend = NA,  
  inherit.aes = TRUE,  
  ...  
)
```

### Arguments

mapping	Set of aesthetic mapping created by <code>aes()</code> . If <code>inherit.aes = TRUE</code> , the mapping can be inherited from the plot mapping as specified in the call to <code>ggplot()</code> .
data	The data to be displayed in this layer. If 'NULL' (the default), the data is inherited from the plot data as specified in the call to <code>ggplot()</code> .
position	Position adjustment.
na.rm	logical. If 'FALSE' (default), missing values are removed with a warning. If 'TRUE', missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? 'NA', the default, includes if any aesthetics are mapped. 'FALSE' never includes, and 'TRUE' always includes.
inherit.aes	logical (defaults to 'TRUE'). If 'FALSE', overrides the default aesthetics, rather than combining with them.
...	additional parameters that passed on to this layer. These are often aesthetics, used to set an aesthetic to a fixed value, like <code>colour = "red"</code> or <code>size = 3</code> .

### Value

tip point layer

### Author(s)

Guangchuang Yu



## References

For more detailed demonstration, please refer to chapter 4.3.2 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

## Examples

```
library(ggtree)
tr<- rtree(15)
x <- ggtree(tr)
x + geom_tippoint()
```

---

geom\_tree

*geom\_tree*

---

## Description

add tree layer

## Usage

```
geom_tree(
  mapping = NULL,
  data = NULL,
  layout = "rectangular",
  multiPhylo = FALSE,
  continuous = "none",
  position = "identity",
  ...
)
```

## Arguments

mapping	aesthetic mapping
data	data of the tree
layout	one of 'rectangular', 'dendrogram', 'slanted', 'ellipse', 'roundrect', 'fan', 'circular', 'inward_circular', 'radial', 'equal_angle', 'daylight' or 'ape'
multiPhylo	logical, whether input data contains multiple phylo class, defaults to "FALSE".
continuous	character, continuous transition for selected aesthetic ('size' or 'color' ('colour')). It should be one of 'color' (or 'colour'), 'size', 'all' and 'none', default is 'none'
position	Position adjustment, either as a string, or the result of a call to a position adjustment function, default is "identity".
...	additional parameter some dot arguments: <ul style="list-style-type: none"> <li>• nsplit integer, the number of branch blocks divided when 'continuous' is not "none", default is 200.</li> </ul>

**Value**

tree layer

**Aesthetics**

geom\_tree() understands the following aesthetics:

- color character, control the color of line, default is black (continuous is "none").
- linetype control the type of line, default is 1 (solid).
- size numeric, control the width of line, default is 0.5 (continuous is "none").

**Author(s)**

Yu Guangchuang

**References**

For demonstration of this function, please refer to chapter 4.2.1 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**Examples**

```
tree <- rtree(10)
ggplot(tree) + geom_tree()
```

---

geom\_tree2

*geom\_tree2*

---

**Description**

add tree layer

**Usage**

```
geom_tree2(layout = "rectangular", ...)
```

**Arguments**

layout	one of 'rectangular', 'slanted', 'circular', 'radial' or 'unrooted'
...	additional parameter

**Value**

tree layer

**Author(s)**

Yu Guangchuang

---

geom_treescale	<i>geom_treescale</i>
----------------	-----------------------

---

### Description

add tree scale to a tree

### Usage

```
geom_treescale(  
  x = NULL,  
  y = NULL,  
  width = NULL,  
  offset = NULL,  
  offset.label = NULL,  
  label = NULL,  
  color = "black",  
  linesize = 0.5,  
  fontsize = 3.88,  
  family = "sans"  
)
```

### Arguments

x	set x position of the scale
y	set y position of the scale
width	set the length of the tree scale
offset	set offset of text to line, defaults to NULL
offset.label	set offset of the scale title to line.
label	set the title of tree scale, defaults to NULL.
color	set color of the scale
linesize	set size of line
fontsize	set size of text
family	'sans' by default, can be any supported font

### Details

'geom\_treescale' automatically adds a scale bar for evolutionary distance

### Value

ggplot layers

### Author(s)

Guangchuang Yu

## References

For demonstration of this function, please refer to chapter 4.3.1 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

geom_zoom_clade	<i>geom_zoom_clade</i>
-----------------	------------------------

---

## Description

zoom selected clade of a tree

## Usage

```
geom_zoom_clade(node, xexpand = NULL)
```

## Arguments

node	internal node number to zoom in its corresponding clade
xexpand	numeric, extend x, meaning the ratio of range of the xlim of the original tree, defaults to NULL.

## Details

'geom\_zoom\_clade' zooms in on a selected clade of a tree, while showing its on the full view of tree as a seperated panel for reference

## Value

updated tree view

## Author(s)

Guangchuang Yu

---

get.path	<i>get.path</i>
----------	-----------------

---

**Description**

path from start node to end node

**Usage**

```
get.path(phylo, from, to)
```

**Arguments**

phylo	phylo object
from	start node
to	end node

**Value**

node vectot

**Author(s)**

Guangchuang Yu

---

getNodeAngle.df	<i>getNodeAngle.df</i>
-----------------	------------------------

---

**Description**

Get the angle between the two nodes specified.

**Usage**

```
getNodeAngle.df(df, origin_node_id, node_id)
```

**Arguments**

df	tree data.frame
origin_node_id	origin node id number
node_id	end node id number

**Value**

angle in range  $[-1, 1]$ , i.e. degrees/180, radians/pi

---

getNodeBreadthFirst.df  
*getNodeBreadthFirst.df*

---

**Description**

Get the nodes of tree from root in breadth-first order.

**Usage**

getNodeBreadthFirst.df(df)

**Arguments**

df                    tree data.frame

**Value**

list of node id's in breadth-first order.

---

getSubtree            *getSubtree*

---

**Description**

Get all children of node from tree, including start\_node.

**Usage**

getSubtree(tree, node)

**Arguments**

tree                    ape phylo tree object  
node                    is the tree node id from which the tree is derived.

**Value**

list of all child node id's from starting node.

---

getSubtree.df	<i>getSubtree.df</i>
---------------	----------------------

---

**Description**

Get all children of node from df tree using breath-first.

**Usage**

```
getSubtree.df(df, node)
```

**Arguments**

df	tree data.frame
node	id of starting node.

**Value**

list of all child node id's from starting node.

---

getSubtreeUnrooted	<i>getSubtreeUnrooted</i>
--------------------	---------------------------

---

**Description**

Get all subtrees of specified node. This includes all ancestors and relatives of node and return named list of subtrees.

**Usage**

```
getSubtreeUnrooted(tree, node)
```

**Arguments**

tree	ape phylo tree object
node	is the tree node id from which the subtrees are derived.

**Value**

named list of subtrees with the root id of subtree and list of node id's making up subtree.

---

`getSubtreeUnrooted.df` *getSubtreeUnrooted*

---

**Description**

Get all subtrees of node, as well as remaining branches of parent (ie, rest of tree structure as subtree) return named list of subtrees with list name as starting node id.

**Usage**

```
getSubtreeUnrooted.df(df, node)
```

**Arguments**

<code>df</code>	tree data.frame
<code>node</code>	is the tree node id from which the subtrees are derived.

**Value**

named list of subtrees with the root id of subtree and list of node id's making up subtree.

---

`getTreeArcAngles` *getTreeArcAngles*

---

**Description**

Find the right (clockwise rotation, angle from +ve x-axis to furthest subtree nodes) and left (anti-clockwise angle from +ve x-axis to subtree) Returning arc angle in  $[0, 2]$  (0 to 360) domain.

**Usage**

```
getTreeArcAngles(df, origin_id, subtree)
```

**Arguments**

<code>df</code>	tree data.frame
<code>origin_id</code>	node id from which to calculate left and right hand angles of subtree.
<code>subtree</code>	named list of root id of subtree (node) and list of node ids for given subtree (subtree).

**Value**

named list with right and left angles in range  $[0, 2]$  i.e  $1 = 180$  degrees,  $1.5 = 270$  degrees.



---

get\_clade\_position     *get\_clade\_position*

---

**Description**

get position of clade (xmin, xmax, ymin, ymax)

**Usage**

```
get_clade_position(treeview, node)
```

**Arguments**

treeview	tree view
node	selected node

**Value**

data.frame

**Author(s)**

Guangchuang Yu

---

get\_heatmap\_column\_position  
*get\_heatmap\_column\_position*

---

**Description**

return a data.frame that contains position information for labeling column names of heatmap produced by gheatmap function

**Usage**

```
get_heatmap_column_position(treeview, by = "bottom")
```

**Arguments**

treeview	output of gheatmap
by	one of 'bottom' or 'top'

**Value**

data.frame

**Author(s)**

Guangchuang Yu

---

*get\_taxa\_name*                      *get\_taxa\_name*

---

**Description**

get taxa name of a selected node (or tree if node=NULL) sorted by their position in plotting

**Usage**

```
get_taxa_name(tree_view = NULL, node = NULL)
```

**Arguments**

<code>tree_view</code>	tree view (i.e. the ggtree object). If <code>tree_view</code> is NULL, the last ggplot object will be used.
<code>node</code>	internal node number to specify a clade. If NULL, using the whole tree

**Details**

This function extract an ordered vector of the tips from selected clade or the whole tree based on the ggtree() plot.

**Value**

ordered taxa name vector

**Author(s)**

Guangchuang Yu

**Examples**

```
tree <- rtree(30)
p <- ggtree(tree)
get_taxa_name(p)
```

---

`ggdensitree``ggdensitree`

---

## Description

drawing phylogenetic trees from list of phylo objects

## Usage

```
ggdensitree(  
  data = NULL,  
  mapping = NULL,  
  layout = "slanted",  
  tip.order = "mode",  
  align.tips = TRUE,  
  jitter = 0,  
  ...  
)
```

## Arguments

<code>data</code>	a list of phylo objects or any object with an <code>as.phylo</code> and <code>fortify</code> method
<code>mapping</code>	aesthetic mapping
<code>layout</code>	one of 'slanted', 'rectangular', 'fan', 'circular' or 'radial' (default: 'slanted')
<code>tip.order</code>	the order of the tips by a character vector of taxa names; or an integer, N, to order the tips by the order of the tips in the Nth tree; 'mode' to order the tips by the most common order; 'mds' to order the tips based on MDS of the path length between the tips; or 'mds_dist' to order the tips based on MDS of the distance between the tips (default: 'mode')
<code>align.tips</code>	TRUE (default) to align trees by their tips and FALSE to align trees by their root
<code>jitter</code>	deviation to jitter tips
<code>...</code>	additional parameters passed to <code>fortify</code> , <code>ggtree</code> and <code>geom_tree</code>

## Details

The trees plotted by '`ggdensitree()`' will be stacked on top of each other and the structures of the trees will be rotated to ensure the consistency of the tip order.

## Value

tree layer

## Author(s)

Yu Guangchuang, Bradley R. Jones



**Description**

If you use ggtree in published research, please cite: Guangchuang Yu, David Smith, Huachen Zhu, Yi Guan, Tommy Tsan-Yuk Lam. ggtree: an R package for visualization and annotation of phylogenetic trees with their covariates and other associated data. *Methods in Ecology and Evolution* 2017, 8(1):28-36, doi:10.1111/2041-210X.12628

drawing phylogenetic tree from phylo object

**Usage**

```
ggtree(
  tr,
  mapping = NULL,
  layout = "rectangular",
  open.angle = 0,
  mrsd = NULL,
  as.Date = FALSE,
  yscale = "none",
  yscale_mapping = NULL,
  ladderize = TRUE,
  right = FALSE,
  branch.length = "branch.length",
  root.position = 0,
  xlim = NULL,
  layout.params = list(),
  ...
)
```

**Arguments**

tr	phylo object
mapping	aesthetic mapping
layout	one of 'rectangular', 'dendrogram', 'slanted', 'ellipse', 'roundrect', 'fan', 'circular', 'inward_circular', 'radial', 'equal_angle', 'daylight' or 'ape'
open.angle	open angle, only for 'fan' layout
mrsd	most recent sampling date
as.Date	logical whether using Date class in time tree
yscale	y scale
yscale_mapping	yscale mapping for category variable
ladderize	logical (default TRUE). Should the tree be re-organized to have a 'ladder' aspect?
right	logical. If ladderize = TRUE, should the ladder have the smallest clade on the right-hand side? See <a href="#">ape::ladderize()</a> for more information.
branch.length	variable for scaling branch, if 'none' draw cladogram
root.position	position of the root node (default = 0)
xlim	x limits, only works for 'inward_circular' layout

layout.params list, the parameters of layout, when layout is a function.  
 ... additional parameter  
 some dot arguments:

- nsplit integer, the number of branch blocks divided when 'continuous' is not "none", default is 200.

**Value**

tree

**Author(s)**

Yu Guangchuang

**References**

1. G Yu, TTY Lam, H Zhu, Y Guan (2018). Two methods for mapping and visualizing associated data on phylogeny using ggtree. *Molecular Biology and Evolution*, 35(2):3041-3043. <https://doi.org/10.1093/molbev/msy194>
2. G Yu, DK Smith, H Zhu, Y Guan, TTY Lam (2017). ggtree: an R package for visualization and annotation of phylogenetic trees with their covariates and other associated data. *Methods in Ecology and Evolution*, 8(1):28-36. <https://doi.org/10.1111/2041-210X.12628>

For more information, please refer to *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**See Also**

[geom\\_tree\(\)](#)

**Examples**

```
require(ape)
tr <- rtree(10)
ggtree(tr)
```

---

gheatmap

*gheatmap*

---

**Description**

append a heatmap of a matrix to the right side of a phylogenetic tree

**Usage**

```

gheatmap(
  p,
  data,
  offset = 0,
  width = 1,
  low = "green",
  high = "red",
  color = "white",
  colnames = TRUE,
  colnames_position = "bottom",
  colnames_angle = 0,
  colnames_level = NULL,
  colnames_offset_x = 0,
  colnames_offset_y = 0,
  font.size = 4,
  family = "",
  hjust = 0.5,
  legend_title = "value",
  custom_column_labels = NULL
)

```

**Arguments**

<code>p</code>	tree view
<code>data</code>	matrix or data.frame
<code>offset</code>	set offset of the heatmap to tree
<code>width</code>	total width of heatmap, compare to width of tree, defaults to 1, which means they are of the same length
<code>low</code>	set color of the lowest value, defaults to "green"
<code>high</code>	set color of the highest value, defaults to "red"
<code>color</code>	set color of heatmap cell border, defaults to "white"
<code>colnames</code>	logical, whether to add matrix colnames, defaults to "TRUE"
<code>colnames_position</code>	set the position of the colnames, one of 'bottom' (default) or 'top'
<code>colnames_angle</code>	set the angle of colnames
<code>colnames_level</code>	set levels of colnames
<code>colnames_offset_x</code>	set x offset for colnames
<code>colnames_offset_y</code>	set y offset for colnames
<code>font.size</code>	set font size of matrix colnames
<code>family</code>	font of matrix colnames, can be any supported font
<code>hjust</code>	adjust horizontal position of column names (0: align left, 0.5: align center (default), 1: align right)

legend\_title title of fill legend  
custom\_column\_labels  
instead of using the colnames from the input matrix/data.frame, input a custom vector to be set as column labels

### Value

tree view

### Author(s)

Guangchuang Yu

### References

For demonstration of this function, please refer to chapter 7.3 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

gzoom	<i>gzoom method</i>
-------	---------------------

---

### Description

gzoom method  
gzoom method  
zoom selected subtree

### Usage

```
gzoom(object, focus, subtree = FALSE, widths = c(0.3, 0.7), ...)  
  
## S4 method for signature 'ggtree'  
gzoom(object, focus, widths = c(0.3, 0.7), xmax_adjust = 0)  
  
## S4 method for signature 'treedata'  
gzoom(object, focus, subtree = FALSE, widths = c(0.3, 0.7))  
  
## S4 method for signature 'phylo'  
gzoom(object, focus, subtree = FALSE, widths = c(0.3, 0.7))
```



**Arguments**

object	supported tree objects
focus	selected tips
subtree	logical
widths	widths
...	additional parameter
xmax_adjust	adjust xmax (xlim[2])

**Value**

figure

---

gzoom.phylo

*gzoom*

---

**Description**

plots simultaneously a whole phylogenetic tree and a portion of it.

**Usage**

```
gzoom.phylo(phy, focus, subtree = FALSE, widths = c(0.3, 0.7))
```

**Arguments**

phy	phylo object
focus	selected tips
subtree	logical
widths	widths

**Value**

a list of ggplot object

**Author(s)**

ygc

---

hexpand	<i>hexpand</i>
---------	----------------

---

## Description

hexpand

vexpand

expand xlim (ylim) by ratio of x (y) axis range

## Usage

```
hexpand(ratio, direction = 1)
```

```
vexpand(ratio, direction = 1)
```

```
ggexpand(ratio, direction = 1, side = "hv")
```

## Arguments

ratio	expand x (y) axis limits by amount of xrange (yrange) * ratio
direction	expand x axis limit at right hand side if direction is 1 (default), or left hand side if direction is -1
side	one of 'h' for horizontal and 'v' for vertical or 'hv' for both (default).

## Value

ggexpand object

## Author(s)

Guangchuang Yu

## Examples

```
x <- rtree(20)
x$tip.label <- paste0('RRRRREEEEEEAAAAALLLLLYYYYY_Long_Label_', x$tip.label)
p1 <- ggtree(x) + geom_tiplab()
p1 + ggexpand(1.5, side = "h")
```

---

label_pad	<i>Padding taxa labels</i>
-----------	----------------------------

---

### Description

This function adds padding characters to the left side of taxa labels, adjust their length to the longest label.

### Usage

```
label_pad(label, justify = "right", pad = ".")
```

### Arguments

label	taxa label
justify	should a character vector be right-justified (default), left-justified, centred or left alone.
pad	padding character (defaults to dots)

### Value

Taxa labels with padding characters added

### Author(s)

Guangchuang Yu and Yonghe Xia

### References

<https://groups.google.com/g/bioc-ggtree/c/INJ0Nfkq3b0/m/1XefnfV5AQAJ>

### Examples

```
library(ggtree)
set.seed(2015-12-21)
tree <- rtree(5)
tree$tip.label[2] <- "long string for test"
label_pad(tree$tip.label)
```

---

layoutDaylight	<i>Equal daylight layout method for unrooted trees.</i>
----------------	---

---

**Description**

#' @title

**Usage**

```
layoutDaylight(model, branch.length, MAX_COUNT = 5)
```

**Arguments**

model	tree object, e.g. phylo or treedata
branch.length	set to 'none' for edge length of 1. Otherwise the phylogenetic tree edge length is used.
MAX_COUNT	the maximum number of iterations to run (default 5)

**Value**

tree as data.frame with equal angle layout.

**References**

The following algorithm aims to implement the vague description of the "Equal-daylight Algorithm" in "Inferring Phylogenies" pp 582-584 by Joseph Felsenstein.

```
Leafs are subtrees with no children
Initialise tree using equal angle algorithm
tree_df = equal_angle(tree)
```

```
nodes = get list of nodes in tree_df breadth-first
nodes = remove tip nodes.
```

---

layoutEqualAngle	<i>layoutEqualAngle</i>
------------------	-------------------------

---

**Description**

'Equal-angle layout algorithm for unrooted trees'

**Usage**

```
layoutEqualAngle(model, branch.length = "branch.length")
```

**Arguments**

model                    tree object, e.g. phylo or treedata  
branch.length        set to 'none' for edge length of 1. Otherwise the phylogenetic tree edge length is used.

**Value**

tree as data.frame with equal angle layout.

**References**

"Inferring Phylogenies" by Joseph Felsenstein.

---

`layout_rectangular`     *layout\_rectangular*

---

**Description**

transform circular/fan layout to rectangular layout  
transform rectangular layout to circular layout  
transform rectangular/circular layout to inward circular layout  
transform rectangular/circular layout to fan layout  
transform rectangular layout to dendrogram layout

**Usage**

```
layout_rectangular()  
  
layout_circular()  
  
layout_inward_circular(xlim = NULL)  
  
layout_fan(angle = 180)  
  
layout_dendrogram()
```

**Arguments**

xlim                    setting x limits, which will affect the center space of the tree  
angle                    open tree at specific angle

**Author(s)**

Guangchuang Yu

**Examples**

```

tree <- rtree(20)
p <- ggtree(tree, layout = "circular") + layout_rectangular()
tree <- rtree(20)
p <- ggtree(tree)
p + layout_circular()
tree <- rtree(20)
p <- ggtree(tree)
p + layout_inward_circular(xlim=4) + geom_tiplab(hjust=1)
tree <- rtree(20)
p <- ggtree(tree)
p + layout_fan(angle=90)
tree <- rtree(20)
p <- ggtree(tree)
p + p + layout_dendrogram()

```

---

msaplot

*msaplot*


---

**Description**

visualize phylogenetic tree with multiple sequence alignment

**Usage**

```

msaplot(
  p,
  fasta,
  offset = 0,
  width = 1,
  color = NULL,
  window = NULL,
  bg_line = TRUE,
  height = 0.8
)

```

**Arguments**

p	tree view
fasta	fasta file that contains multiple sequence alignment information
offset	set the offset of MSA to tree
width	total width of alignment, compare to width of tree, defaults to 1, which means they are of the same length
color	set color of the tree
window	specific a slice of alignment to display
bg_line	whether to add background line in alignment, defaults to "TRUE"
height	height ratio of sequence, defaults to 0.8

**Value**

tree view

**Author(s)**

Guangchuang Yu

**References**

For demonstration of this function, please refer to chapter 7.4 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

multiplot

*multiplot*

---

**Description**

plot multiple ggplot objects in one page

**Usage**

```
multiplot(  
  ...,  
  plotlist = NULL,  
  ncol,  
  widths = rep_len(1, ncol),  
  labels = NULL,  
  label_size = 5  
)
```

**Arguments**

...	plots
plotlist	plot list
ncol	set the number of column to display the plots
widths	the width of each plot
labels	set labels for labeling the plots
label_size	set font size of the label

**Value**

plot

**Author(s)**

Guangchuang Yu

---

nodebar	<i>nodebar</i>
---------	----------------

---

**Description**

generate a list of bar charts for results of ancestral state reconstruction

**Usage**

```
nodebar(data, cols, color, alpha = 1, position = "stack")
```

**Arguments**

data	a data.frame of stats with an additional column of node number named "node"
cols	columns of the data.frame that store the stats
color	set color of bars
alpha	set transparency of the charts
position	position of bars, if 'stack' (default) make bars stacked atop one another, 'dodge' make them dodged side-to-side

**Value**

list of ggplot objects

**Author(s)**

Guangchuang Yu

---

nodepie	<i>nodepie</i>
---------	----------------

---

**Description**

generate a list of pie charts for results of ancestral stat reconstruction

**Usage**

```
nodepie(data, cols, color, alpha = 1)
```

**Arguments**

data	a data.frame of stats with an additional column of node number named "node"
cols	columns of the data.frame that store the stats
color	set color of bars
alpha	set transparency of the charts



**Value**

list of ggplot objects

**Author(s)**

Guangchuang Yu

---

open_tree	<i>open_tree</i>
-----------	------------------

---

**Description**

transform a tree in either rectangular or circular layout into the fan layout that opens with a specific angle

**Usage**

```
open_tree(treeview, angle)
```

**Arguments**

treeview	tree view in rectangular/circular layout
angle	open the tree at a specific angle

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

**Examples**

```
tree <- rtree(15)
p <- ggtree(tree) + geom_tiplab()
open_tree(p, 180)
```

---

range_format	<i>range_format</i>
--------------	---------------------

---

**Description**

format a list of range (HPD, CI, etc that has length of 2)

**Usage**

```
range_format(x, trans = NULL)
```

**Arguments**

x	input list
trans	transformation function

**Value**

character vector of [lower, upper]

**Author(s)**

Guangchuang Yu

---

revts	<i>revts</i>
-------	--------------

---

**Description**

reverse timescle x-axis by setting the most recent tip to 0

**Usage**

```
revts(treeview)
```

**Arguments**

treeview	original tree view
----------	--------------------

**Details**

'scale\_x\_continuous(labels=abs)' is required if users want to set the x-axis lable to absolute value

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

**Examples**

```
tr <- rtree(10)
p <- ggtree(tr) + theme_tree2()
p2 <- revts(p)
p2 + scale_x_continuous(labels=abs)
```

---

rotate

*rotate*

---

**Description**

rotate selected clade by 180 degree

**Usage**

```
rotate(tree_view = NULL, node)
```

**Arguments**

tree_view	tree view (i.e. the ggtree object). If tree_view is NULL, the last ggplot object will be used.
node	internal node number to specify a clade. If NULL, using the whole tree

**Value**

ggplot2 object

**Author(s)**

Guangchuang Yu

**Examples**

```
x <- rtree(15)
p <- ggtree(x) + geom_tiplab()
rotate(p, 17)
```

---

rotateTreePoints.df	<i>rotateTreePoints.data.frame</i>
---------------------	------------------------------------

---

**Description**

Rotate the points in a tree data.frame around a pivot node by the angle specified.

**Usage**

```
rotateTreePoints.df(df, pivot_node, nodes, angle)
```

**Arguments**

df	tree data.frame
pivot_node	is the id of the pivot node.
nodes	list of node numbers that are to be rotated by angle around the pivot_node
angle	in range $[0, 2]$ , ie degrees/180, radians/pi

**Value**

updated tree data.frame with points rotated by angle

---

rotate_tree	<i>rotate_tree</i>
-------------	--------------------

---

**Description**

rotate circular tree in a certain angle

**Usage**

```
rotate_tree(treeview, angle)
```

**Arguments**

treeview	tree view in circular layout
angle	the angle of rotation

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

**Examples**

```
tree <- rtree(15)
p <- ggtree(tree) + geom_tiplab()
p2 <- open_tree(p, 180)
rotate_tree(p2, 180)
```

---

scaleClade

*scaleClade*


---

**Description**

zoom out/in a selected clade to emphasize or de-emphasize it

**Usage**

```
scaleClade(tree_view = NULL, node, scale = 1, vertical_only = TRUE)
```

**Arguments**

tree_view	tree view (i.e. the ggtree object). If tree_view is NULL, the last ggplot object will be used.
node	internal node number to specify a clade. If NULL, using the whole tree
scale	the scale of the selected clade. The clade will be zoom in when scale > 1, and will be zoom out when scale < 1
vertical_only	logical. If TRUE (default), only vertical will be scaled. If FALSE, the clade will be scaled vertical and horizontally.

**Value**

tree view

**Author(s)**

Guangchuang Yu

**Examples**

```
x <- rtree(15)
p <- ggtree(x) + geom_tiplab() +
  geom_nodelab(aes(subset=!isTip, label=node), hjust = -.1, color = "red")
scaleClade(p, 24, scale = .1)
```

---

scale_color	<i>scale_color method</i>
-------------	---------------------------

---

**Description**

scale\_color method  
 scale color by a numerical tree attribute

**Usage**

```
scale_color(object, by, ...)
```

```
## S4 method for signature 'treedata'
```

```
scale_color(object, by, ...)
```

```
## S4 method for signature 'phylo'
```

```
scale_color(object, by, ...)
```

**Arguments**

object	treedata object
by	one of numerical attributes
...	additional parameter

**Value**

color vector

---

scale_color_subtree	<i>scale_color_subtree</i>
---------------------	----------------------------

---

**Description**

scale tree color by subtree (e.g., output of cutree, kmeans, or other clustering algorithm)

**Usage**

```
scale_color_subtree(group)
```

```
scale_colour_subtree(group)
```

**Arguments**

group	taxa group information
-------	------------------------

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

---

scale_x_ggtree	<i>scale_x_ggtree</i>
----------------	-----------------------

---

**Description**

scale x for tree with gheatmap

**Usage**

```
scale_x_ggtree(breaks = waiver(), labels = waiver())
```

**Arguments**

breaks	set breaks for tree
labels	lables for corresponding breaks

**Details**

Since setting x-axis for tree with gheatmap by using 'theme\_tree2()' is quite tricky, 'scale\_x\_ggtree' can help set the x-axis more reasonably.

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

**References**

For more detailed demonstration of this function, please refer to chapter 7.3 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

scale_x_range	<i>scale_x_range</i>
---------------	----------------------

---

**Description**

add second x-axis for geom\_range

**Usage**

```
scale_x_range()
```

**Details**

notice that the first axis is disabled in the default theme thus users need to enable it first before using scale\_x\_range

**Value**

ggtree object

**Author(s)**

Guangchuang Yu

**References**

For demonstration of this function ,please refer to chapter 5.2.4 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

---

set_highlight_legend	<i>set_highlight_legend</i>
----------------------	-----------------------------

---

**Description**

set legend for multiple geom\_highlight layers

**Usage**

```
set_highlight_legend(p, color, label, alpha = 1)
```

**Arguments**

p	ggtree object
color	color vector
label	label vector
alpha	transparency of color



**Value**

updated ggtree object

**Author(s)**

Guangchuang Yu

---

StatBalance	<i>StatBalance</i>
-------------	--------------------

---

**Description**

StatBalance

---

td_filter	<i>td-filter</i>
-----------	------------------

---

**Description**

filter data for tree annotation layer

**Usage**

```
td_filter(..., .f = NULL)
```

**Arguments**

... Expressions that return a logical value.  
 .f a function (if any, defaults to NULL) that pre-operate the data

**Details**

The 'td\_filter()' function returns another function that can be used to subset ggtree() plot data. The function can be passed to the 'data' parameter of geom layer to perform subsetting. All rows that satisfy your conditions will be retained.

**Value**

A function to filter ggtree plot data using conditions defined by '...'.

**Author(s)**

Guangchuang Yu

## References

For more detailed demonstration of this function, please refer to chapter 12.5.1 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

## See Also

[filter](#)

## Examples

```
tree <- rtree(30)
## similar to 'ggtree(tree) + geom_tippoint()'
ggtree(tree) + geom_point(data = td_filter(isTip))
```

---

td\_mutate

*td-mutate*

---

## Description

mutate data for tree annotation layer

## Usage

```
td_mutate(..., .f = NULL)
```

## Arguments

... additional parameters that pass to dplyr::mutate  
.f a function (if any, defaults to NULL) that pre-operate the data

## Details

The 'td\_mutate()' function returns another function that can be used to mutate ggtree() plot data. The function can be passed to the 'data' parameter of geom layer to perform adding new variables and preserving existing ones.

## Value

A function to mutate ggtree plot data

## See Also

[mutate](#)

---

td_unnest	<i>td-unnest</i>
-----------	------------------

---

**Description**

flatterns a list-column of data frame

**Usage**

```
td_unnest(cols, ..., .f = NULL)
```

**Arguments**

cols	columns to unnest
...	additional parameters that pass to tidyr::unnest
.f	a function (if any, defaults to NULL) that pre-operate the data

**Details**

The 'td\_unnest' function returns another function that can be used to unnest ggtree() plot data. The function can be passed to the 'data' parameter of a geom layer to flattern list-cloumn tree data.

**Value**

A function to unnest ggtree plot data

**Author(s)**

Guangchuang Yu

**References**

For demonstration of this function, please refer to chapter 12.5.2 of *Data Integration, Manipulation and Visualization of Phylogenetic Trees* <http://yulab-smu.top/treedata-book/index.html> by Guangchuang Yu.

**See Also**

[unnest](#)

---

theme_dendrogram	<i>theme_dendrogram</i>
------------------	-------------------------

---

**Description**

dendrogram theme

**Usage**

```
theme_dendrogram(bgcolor = "white", fgcolor = "black", ...)
```

**Arguments**

bgcolor	set background color, defaults to "white"
fgcolor	set color of axis
...	additional parameter

**Author(s)**

Guangchuang Yu

---

theme_inset	<i>theme_inset</i>
-------------	--------------------

---

**Description**

inset theme

**Usage**

```
theme_inset(legend.position = "none", ...)
```

**Arguments**

legend.position	set the position of legend
...	additional parameter

**Details**

theme for inset function

**Value**

ggplot object

**Author(s)**

Guangchuang Yu

---

theme\_tree

*theme\_tree*

---

**Description**

tree theme

**Usage**

```
theme_tree(bgcolor = "white", ...)
```

**Arguments**

bgcolor	set background color, defaults to "white"
...	additional parameter

**Details**

'theme\_tree' defines a blank background to display tree

**Value**

updated ggplot object with new theme

**Author(s)**

Guangchuang Yu

**Examples**

```
require(ape)
tr <- rtree(10)
ggtree(tr) + theme_tree()
```

---

theme_tree2	<i>theme_tree2</i>
-------------	--------------------

---

**Description**

tree2 theme

**Usage**

```
theme_tree2(bgcolor = "white", fgcolor = "black", ...)
```

**Arguments**

bgcolor	set background color, defaults to "white"
fgcolor	set foreground color, defaults to "black"
...	additional parameter

**Details**

'theme\_tree2' supports displaying phylogenetic distance by setting x-axis

**Value**

updated ggplot object with new theme

**Author(s)**

Guangchuang Yu

**Examples**

```
require(ape)
tr <- rtree(10)
ggtree(tr) + theme_tree2()
```

---

viewClade	<i>viewClade</i>
-----------	------------------

---

**Description**

view a selected clade of tree, clade can be selected by specifying a node number or determined by the most recent common ancestor of selected tips

**Usage**

```
viewClade(tree_view = NULL, node, xmax_adjust = 0)
```

**Arguments**

<code>tree_view</code>	tree view (i.e. the <code>ggtree</code> object). If <code>tree_view</code> is <code>NULL</code> , the last <code>ggplot</code> object will be used.
<code>node</code>	internal node number to specify a clade. If <code>NULL</code> , using the whole tree
<code>xmax_adjust</code>	adjust the max range of x axis

**Value**

clade plot

**Author(s)**

Guangchuang Yu

**Examples**

```
x <- rtree(15)
p <- ggtree(x) + geom_tiplab()
viewClade(p, 18, xmax_adjust = 0.)
```

---

`xlim_expand`

*xlim\_expand*

---

**Description**

expand x axis limits for specific panel

**Usage**

```
xlim_expand(xlim, panel)
```

**Arguments**

<code>xlim</code>	x axis limits
<code>panel</code>	name of the panel to expand

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

**Examples**

```
x <- rtree(30)
p <- ggtree(x) + geom_tiplab()
d <- data.frame(label = x$tip.label,
                value = rnorm(30))
p2 <- p + geom_facet(panel = "Dot", data = d,
                    geom = geom_point, mapping = aes(x = value))
p2 + xlim_expand(c(-10, 10), 'Dot')
```

---

`xlim_tree``xlim_tree`

---

**Description**

set x axis limits specially for Tree panel

**Usage**

```
xlim_tree(xlim)
```

**Arguments**

`xlim` x axis limits

**Value**

updated tree view

**Author(s)**

Guangchuang Yu

**Examples**

```
x <- rtree(30)
p <- ggtree(x) + geom_tiplab()
d <- data.frame(label = x$tip.label,
                value = rnorm(30))
p2 <- p + geom_facet(panel = "Dot", data = d,
                    geom = geom_point, mapping = aes(x = value))
p2 + xlim_tree(6)
```



---

zoomClade	<i>zoomClade</i>
-----------	------------------

---

**Description**

zoom in on a selected clade of a tree, while showing its on the full view of tree as a seperated panel for reference

**Usage**

```
zoomClade(tree_view = NULL, node, xexpand = NULL)
```

**Arguments**

tree_view	tree view (i.e. the ggtree object). If tree_view is NULL, the last ggplot object will be used.
node	internal node number to specify a clade. If NULL, using the whole tree
xexpand	numeric, expend the xlim of the zoom area. default is NULL.

**Value**

full tree with zoom in clade

**Author(s)**

Guangchuang Yu

**Examples**

```
x <- rtree(15)
p <- ggtree(x) + geom_tiplab() +
  geom_nodelab(aes(subset=!isTip, label=node), hjust = -.1, color = "red")
zoomClade(p, 21, xexpand = .2)
```

---

%+>%	<i>%+&gt;%</i>
------	----------------

---

**Description**

update data with tree info (y coordination and panel)

**Usage**

```
p %+>% data
```

**Arguments**

p	tree view
data	data.frame

**Details**

add tree information to an input data. This function will setup y coordination and panel info for data used in facet\_plot and geom\_facet

**Value**

updated data.frame

**Author(s)**

Guangchuang Yu

**References**

G Yu, TTY Lam, H Zhu, Y Guan (2018). Two methods for mapping and visualizing associated data on phylogeny using ggtree. *Molecular Biology and Evolution*, 35(2):3041-3043. <https://doi.org/10.1093/molbev/msy194>

---

%<+%>

%<+%>

---

**Description**

add annotation data to a tree

**Usage**

pg %<+%> data

**Arguments**

pg	ggplot2 object
data	annotation data that contains a column of “node” , or the first column of taxa labels

**Details**

This operator attaches annotation data to a ggtree graphic object

**Value**

ggplot object with annotation data added

**Author(s)**

Guangchuang Yu

**References**

G Yu, TTY Lam, H Zhu, Y Guan (2018). Two methods for mapping and visualizing associated data on phylogeny using ggtree. *Molecular Biology and Evolution*, 35(2):3041-3043. <https://doi.org/10.1093/molbev/msy194>

**See Also**

geom\_facet

**Examples**

```
nwk <- system.file("extdata", "sample.nwk", package="treeio")
tree <- read.tree(nwk)
p <- ggtree(tree)
dd <- data.frame(taxa=LETTERS[1:13],
                 place=c(rep("GZ", 5), rep("HK", 3), rep("CZ", 4), NA),
                 value=round(abs(rnorm(13, mean=70, sd=10)), digits=1))
row.names(dd) <- NULL
p %<+% dd + geom_text(aes(color=place, label=label), hjust=-0.5)
```

---

%<%

%<%

---

**Description**

update tree

**Usage**

pg %&lt;% x

**Arguments**

pg	ggtree object
x	tree object

**Details**

This operator apply the visualization directives in ggtree object (lhs) to visualize another tree object (rhs), that is similar to Format Painter.

**Value**

updated ggplot object

**Author(s)**

Guangchuang Yu

**Examples**

```
library("ggplot2")
nwk <- system.file("extdata", "sample.nwk", package="treeio")
tree <- read.tree(nwk)
p <- ggtree(tree) + geom_tippoint(color="#b5e521", alpha=1/4, size=10)
p %<% rtree(30)
```

# Index

- \* **datasets**
  - StatBalance, 81
- %+>%, 89
- %<+%, 90
- %<%, 91
  
- add\_colorbar, 4
- ape::ladderize(), 61
- applyLayoutDaylight, 5
- as.polytomy, 5
  
- collapse.ggtree, 6
  
- Date2decimal, 7
- decimal2Date, 7
  
- expand, 8
  
- facet\_data, 8
- facet\_labeller, 9
- facet\_plot, 10
- facet\_widths, 11
- filter, 82
- flip, 11
  
- geom\_aline, 12
- geom\_balance, 13
- geom\_cladelab, 14
- geom\_cladelabel, 17, 20
- geom\_cladelabel2, 18, 19
- geom\_facet (facet\_plot), 10
- geom\_highlight (geom\_hilight), 20
- geom\_hilight, 20
- geom\_inset, 23
- geom\_label, 25
- geom\_label2, 24
- geom\_motif, 26
- geom\_nodelab, 27
- geom\_nodelab2, 28
- geom\_nodepoint, 29, 31, 35
- geom\_point, 31, 35
  
- geom\_point2, 30
- geom\_range, 32
- geom\_rootedge, 33
- geom\_rootpoint, 31, 34, 35
- geom\_segment, 37
- geom\_segment2, 36
- geom\_strip, 37
- geom\_striplab, 39
- geom\_taxalink, 42
- geom\_text, 44
- geom\_text2, 43
- geom\_tiplab, 44, 47
- geom\_tiplab(), 27, 28
- geom\_tiplab2, 47
- geom\_tippoint, 31, 35, 48
- geom\_tree, 49
- geom\_tree(), 62
- geom\_tree2, 50
- geom\_treescale, 51
- geom\_zoom\_clade, 52
- get.path, 53
- get\_clade\_position, 57
- get\_heatmap\_column\_position, 57
- get\_taxa\_name, 58
- getNodeAngle.df, 53
- getNodesBreadthFirst.df, 54
- getSubtree, 54
- getSubtree.df, 55
- getSubtreeUnrooted, 55
- getSubtreeUnrooted.df, 56
- getTreeArcAngles, 56
- ggdensitree, 59
- ggexpand (hexpand), 66
- ggtree, 60
- gheatmap, 62
- gzoom, 64
- gzoom, ggtree-method (gzoom), 64
- gzoom, phylo-method (gzoom), 64
- gzoom, treedata-method (gzoom), 64

gzoom.phylo, 65

hexpand, 66

inset (geom\_inset), 23

label\_pad, 67

layout\_circular (layout\_rectangular), 69

layout\_dendrogram (layout\_rectangular), 69

layout\_fan (layout\_rectangular), 69

layout\_inward\_circular (layout\_rectangular), 69

layout\_rectangular, 69

layoutDaylight, 68

layoutEqualAngle, 68

msaplot, 70

multiplot, 71

mutate, 82

nodebar, 72

nodepie, 72

open\_tree, 73

package-ggtree (ggtree), 60

range\_format, 74

revts, 74

rotate, 75

rotate\_tree, 76

rotateTreePoints.df, 76

scale\_color, 78

scale\_color, phylo-method (scale\_color), 78

scale\_color, treedata-method (scale\_color), 78

scale\_color\_subtree, 78

scale\_colour\_subtree (scale\_color\_subtree), 78

scale\_x\_ggtree, 79

scale\_x\_range, 80

scaleClade, 77

set\_highlight\_legend, 80

StatBalance, 81

td\_filter, 81

td\_mutate, 82

td\_unnest, 83

theme\_dendrogram, 84

theme\_inset, 84

theme\_tree, 85

theme\_tree2, 86

unnest, 83

vexpand (hexpand), 66

viewClade, 86

xlim\_expand, 87

xlim\_tree, 88

zoomClade, 89