

Package ‘treeio’

May 30, 2024

Title Base Classes and Functions for Phylogenetic Tree Input and Output

Version 1.28.0

Description ‘treeio’ is an R package to make it easier to import and store phylogenetic tree with associated data; and to link external data from different sources to phylogeny. It also supports exporting phylogenetic tree with heterogeneous associated data to a single tree file and can be served as a platform for merging tree with associated data and converting file formats.

Depends R (>= 3.6.0)

Imports ape, dplyr, jsonlite, magrittr, methods, rlang, stats, tibble, tidytree (>= 0.4.5), utils, yulab.utils (> 0.1.1)

Suggests Biostrings, cli, ggplot2, ggtree, igraph, knitr, rmarkdown, phangorn, prettydoc, purrr, testthat, tidyr, vroom, xml2, yaml

VignetteBuilder knitr

ByteCompile true

License Artistic-2.0

Encoding UTF-8

URL <https://github.com/YuLab-SMU/treeio> (devel),
<https://docs.ropensci.org/treeio/> (docs),
<https://www.amazon.com/Integration-Manipulation-Visualization-Phylogenetic-Computational-ebook/dp/B0B5NLZR1Z/>
(book), <https://doi.org/10.1093/molbev/msz240> (paper)

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

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| | |
|----------------|--|
| treeio-package | <i>treeio: Base Classes and Functions for Phylogenetic Tree Input and Output</i> |
|----------------|--|

Description

'treeio' is an R package to make it easier to import and store phylogenetic tree with associated data; and to link external data from different sources to phylogeny. It also supports exporting phylogenetic tree with heterogeneous associated data to a single tree file and can be served as a platform for merging tree with associated data and converting file formats.

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See Also

Useful links:

- [https://github.com/YuLab-SMU/treeio\(devel\)](https://github.com/YuLab-SMU/treeio(devel))
- [https://docs.ropensci.org/treeio/\(docs\)](https://docs.ropensci.org/treeio/(docs))

- <https://www.amazon.com/Integration-Manipulation-Visualization-Phylogenetic-Computational-ebook/dp/B0B5NLZR1Z/> (book)
- [doi:10.1093/molbev/msz240](https://doi.org/10.1093/molbev/msz240) (paper)
- Report bugs at <https://github.com/YuLab-SMU/treeio/issues>

as.treedata.phylo *as.treedata*

Description

convert phylo to treedata

Usage

```
## S3 method for class 'phylo'
as.treedata(tree, boot = NULL, ...)
```

Arguments

| | |
|------|---|
| tree | input tree, a phylo object |
| boot | optional, can be bootstrap value from ape::boot.phylo |
| ... | additional parameters |

Details

converting phylo object to treedata object

Author(s)

Guangchuang Yu

find.hclust *find the hierarchical cluster analysis among the nodes of graph based on the length of all the shortest paths in the graph.*

Description

find the hierarchical cluster analysis among the nodes of graph based on the length of all the shortest paths in the graph.

Usage

```
find.hclust(
  x,
  graph.mst = FALSE,
  weights = NULL,
  hclust.method = "average",
  ...
)
```

Arguments

| | |
|----------------------------|--|
| <code>x</code> | a igraph object |
| <code>graph.mst</code> | logical whether obtain the minimum spanning tree first then find.hclust, default is FALSE. |
| <code>weights</code> | a numeric vector giving edge weights or a character. If this is NULL and the graph has a weight edge attribute, then the attribute is used. If this is NA then no weights are used even if the graph has a weight attribute. If this is a character, the graph has the edge attribute which is numeric, then it will be used, default is NULL. |
| <code>hclust.method</code> | the agglomeration method to be used, This should be (an unambiguous abbreviation of) one of "ward.D", "ward.D2", "single", "complete", "average" (= UPGMA), "mcquitty" (= WPGMA), "median" (= WPGMC) or "centroid" (= UPGMC). |
| <code>...</code> | additional parameters |

Value

hclust object

Examples

```
library(igraph)
set.seed(123)
g <- igraph::sample_gnp(100, .1) %>%
  set_edge_attr(name='weight', value=abs(rnorm(E(.),3)))
tr1 <- find.hclust(g, weights = NA)
tr2 <- find.hclust(g)
tr3 <- find.hclust(g, graph.mst = TRUE)
```

get.placements

get.placements

Description

access placement information

Usage

```
get.placements(tree, ...)  
  
## S3 method for class 'jplace'  
get.placements(tree, by = "best", ...)
```

Arguments

| | |
|------|-------------------------|
| tree | tree object |
| ... | additional parameters |
| by | one of 'best' and 'all' |

Value

placement tibble

get.tree

get.tree

Description

access phylo slot

Usage

```
get.tree(x, ...)
```

Arguments

| | |
|-----|-----------------------|
| x | tree object |
| ... | additional parameters |

Value

phylo object

Author(s)

Guangchuang Yu

get.treetext *get.treetext method*

Description

access tree text (newick text) from tree object

Usage

get.treetext(object, ...)

Arguments

| | |
|--------|----------------------|
| object | treedata object |
| ... | additional parameter |

Value

phylo object

getNodeNum *getNodeNum*

Description

calculate total number of nodes

Usage

getNodeNum(tree)

Nnode2(tree)

Arguments

| | |
|------|-------------|
| tree | tree object |
|------|-------------|

Value

number

Author(s)

Guangchuang Yu

Examples

```
getNodeNum(rtree(30))  
Nnode2(rtree(30))
```

is.ggtree

is.ggtree

Description

test whether input object is produced by ggtree function

Usage

```
is.ggtree(x)
```

Arguments

x object

Value

TRUE or FALSE

Author(s)

Guangchuang Yu

jplace-class

Class "jplace" This class stores phylogenetic placements

Description

Class "jplace" This class stores phylogenetic placements

Slots

phylo phylo object for tree structure

treetext newick tree string

data associated data

extraInfo extra information, reserve for merge_tree

file tree file

placements reserve for jplace file to store placement information

info extra information, e.g. metadata, software version etc.

Author(s)

Guangchuang Yu <https://guangchuangyu.github.io>

| | |
|-------------------|--------------------------|
| label_branch_paml | <i>label_branch_paml</i> |
|-------------------|--------------------------|

Description

label branch for PAML to infer selection pressure using branch model

Usage

```
label_branch_paml(tree, node, label)
```

Arguments

| | |
|-------|--------------------------|
| tree | phylo object |
| node | node number |
| label | label of branch, e.g. #1 |

Value

updated phylo object

Author(s)

Guangchuang Yu

| | |
|------|-------------|
| mask | <i>mask</i> |
|------|-------------|

Description

site mask

Usage

```
mask(tree_object, field, site, mask_site = FALSE)
```

Arguments

| | |
|-------------|---|
| tree_object | tree object |
| field | selected field |
| site | site |
| mask_site | if TRUE, site will be masked. if FALSE, selected site will not be masked, while other sites will be masked. |

Value

updated tree object

Author(s)

Guangchuang Yu

| | |
|-------------------------|-------------------|
| <code>merge_tree</code> | <i>merge_tree</i> |
|-------------------------|-------------------|

Description

merge two tree object

Usage

```
merge_tree(obj1, obj2)
```

Arguments

| | |
|-------------------|---------------|
| <code>obj1</code> | tree object 1 |
| <code>obj2</code> | tree object 2 |

Value

tree object

Author(s)

Guangchuang Yu

| | |
|---------------------------------|--------------|
| <code>print.treedataList</code> | <i>print</i> |
|---------------------------------|--------------|

Description

print information of a list of treedata objects

Usage

```
## S3 method for class 'treedataList'  
print(x, ...)
```

Arguments

| | |
|-----|----------------------------|
| x | a list of treedata objects |
| ... | no used |

Value

message

raxml2nwk

raxml2nwk

Description

convert raxml bootstrap tree to newick format

Usage

```
raxml2nwk(infile, outfile = "raxml.tree")
```

Arguments

| | |
|---------|-------------|
| infile | input file |
| outfile | output file |

Value

newick file

Author(s)

Guangchuang Yu

read.astral

read.astral

Description

parse ASTRAL output newick text

Usage

```
read.astral(file)
```

Arguments

| | |
|------|--------------------|
| file | ASTRAL Newick file |
|------|--------------------|

Value

treedata object

Author(s)

Guangchuang Yu

Examples

```
tt <- paste0(
  "((species1,(species2,species3)'[pp1=0.75;pp2=0.24;pp3=0.01]':",
  "1.2003685744180805)'[pp1=0.98;pp2=0.02;pp3=0]':0.9679599282730038,",
  "((species4,species5)'[pp1=0.88;pp2=0.11;pp3=0.01]':1.2454851536484994))"
)
read.astral(textConnection(tt))
```

read.beast

read.beast

Description

read.beast/mrbayes/mega Nexus output

read.beast/mrbayes/mega newick file format

Usage

read.beast(file)

read.mrbayes(file)

read.beast.newick(file)

read.mega(file)

Arguments

file

newick file

Value

treedata object

treedata object

Author(s)

Guangchuang Yu <https://guangchuangyu.github.io>

Bradley R Jones

Examples

```

file <- system.file("extdata/BEAST", "beast_mcc.tree", package="treeio")
read.beast(file)
file <- system.file("extdata/MrBayes", "Gq_nxs.tre", package="treeio")
read.mrbayes(file)
tr <- read.beast.newick(
  textConnection(
    '(a[&rate=1]:2,(b[&rate=1.1]:1,c[&rate=0.9]:1)[&rate=1]:1);'
  )
)

```

read.codeml

read.codeml

Description

read baseml output

Usage

```
read.codeml(rstfile, mlcfile, tree = "mlc", type = "Joint")
```

Arguments

| | |
|---------|------------------------------|
| rstfile | rst file |
| mlcfile | mlc file |
| tree | one of 'mlc' or 'rst' |
| type | one of 'Marginal' or 'Joint' |

Value

A treedata object

Author(s)

Guangchuang Yu

Examples

```

rstfile <- system.file("extdata/PAML_Codeml", "rst", package="treeio")
mlcfile <- system.file("extdata/PAML_Codeml", "mlc", package="treeio")
read.codeml(rstfile, mlcfile)

```

read.codeml_mlc *read.codeml_mlc*

Description

read mlc file of codeml output

Usage

```
read.codeml_mlc(mlcfile)
```

Arguments

mlcfile mlc file

Value

A codeml_mlc object

Author(s)

Guangchuang Yu

Examples

```
mlcfile <- system.file("extdata/PAML_Codeml", "mlc", package="treeio")
read.codeml_mlc(mlcfile)
```

read.fasta *read.fasta*

Description

read FASTA file

Usage

```
read.fasta(fasta, type = "auto")
```

Arguments

fasta fasta file

type sequence type of the input file, one of 'NT' or 'AA'. Default is 'auto' and guess the sequence type automatically

Details

This function supports both DNA or AA sequences

Value

DNABin or AABin object

Author(s)

Guangchuang Yu

| | |
|------------|-------------------|
| read.hyphy | <i>read.hyphy</i> |
|------------|-------------------|

Description

read HYPHY output

Usage

```
read.hyphy(nwk, ancseq, tip.fasfile = NULL)
```

Arguments

| | |
|-------------|--|
| nwk | tree file in nwk format, one of hyphy output |
| ancseq | ancestral sequence file in nexus format, one of hyphy output |
| tip.fasfile | tip sequence file |

Value

A hyphy object

Author(s)

Guangchuang Yu <https://guangchuangyu.github.io>

Examples

```
nwk <- system.file("extdata/HYPHY", "labelledtree.tree", package="treeio")
ancseq <- system.file("extdata/HYPHY", "ancseq.nex", package="treeio")
read.hyphy(nwk, ancseq)
```

read.hyphy.seq *read.hyphy.seq*

Description

parse sequences from hyphy output

Usage

```
read.hyphy.seq(file)
```

Arguments

file output of hyphy ancestral sequence inference; nexus format

Value

DNABin object

Author(s)

Guangchuang Yu

Examples

```
ancseq <- system.file("extdata/HYPHY", "ancseq.nex", package="treeio")
read.hyphy.seq(ancseq)
```

read.iqtree *read.iqtree*

Description

parse IQ-TREE output

Usage

```
read.iqtree(file)
```

Arguments

file IQ-TREE Newick text

Value

treedata object

Author(s)

Guangchuang Yu

read.jplace *read.jplace*

Description

read jplace file

Usage

read.jplace(file)

Arguments

file jplace file

Value

jplace instance

Author(s)

Guangchuang Yu

Examples

```
jp <- system.file("extdata", "sample.jplace", package="treeio")
read.jplace(jp)
```

read.jtree *read.jtree*

Description

Import tree data from jtree file, which is JSON-based text and probably output by write.jtree

Usage

read.jtree(file)

Arguments

file tree file

Value

treedata object

Author(s)

Guangchuang Yu

| | |
|---------------|----------------------|
| read.mcmctree | <i>read.mcmctree</i> |
|---------------|----------------------|

Description

read MCMCTree output Tree

Usage

```
read.mcmctree(file, force.ultrametric = FALSE)
```

Arguments

`file` the output tree file of MCMCTree

`force.ultrametric`

logical whether convert the tree to be ultrametric, if it is not ultrametric, default is FALSE. When the tree is ultrametric, branch times will be calculated automatically.

Value

treedata object

Examples

```
file <- system.file("extdata/MCMCTree", "mcmctree_output.tree", package="treeio")
tr <- read.mcmctree(file)
tr
```

read.mega_tabular *read.mega_tabular*

Description

parse tabular output of MEGA

Usage

```
read.mega_tabular(file)
```

Arguments

file MEGA tabular file

Value

treedata object

Author(s)

Guangchuang Yu

read.newick *read.newick*

Description

read newick tree

Usage

```
read.newick(file, node.label = "label", ...)
```

Arguments

file newick file
node.label parse node label as 'label' or 'support' value
... additional parameter, passed to 'read.tree'

Value

phylo or treedata object

Author(s)

Guangchuang Yu

read.nextstrain.json *read.nextstrain.json*

Description

read.nextstrain.json

Usage

```
read.nextstrain.json(x)
```

Arguments

x the json tree file of auspice from nextstrain.

Value

treedata object

Author(s)

Shuangbin Xu

Examples

```
file1 <- system.file("extdata/nextstrain.json", "minimal_v2.json", package="treeio")
tr <- read.nextstrain.json(file1)
tr
```

read.nhx *read.nhx*

Description

read.nhx tree file

Usage

```
read.nhx(file)
```

Arguments

file nhx file

Value

nhx object

Author(s)

Guangchuang Yu <https://guangchuangyu.github.io>

Examples

```
nhxfile <- system.file("extdata/NHX", "ADH.nhx", package="treeio")
read.nhx(nhxfile)
```

| | |
|---------------|----------------------|
| read.paml_rst | <i>read.paml_rst</i> |
|---------------|----------------------|

Description

read rst file from paml (both baseml and codeml) output

Usage

```
read.paml_rst(rstfile, type = "Joint")
```

Arguments

| | |
|---------|------------------------------|
| rstfile | rst file |
| type | one of 'Marginal' or 'Joint' |

Value

A treedata object

Author(s)

Guangchuang Yu <https://guangchuangyu.github.io>

Examples

```
rstfile <- system.file("extdata/PAML_Baseml", "rst", package="treeio")
read.paml_rst(rstfile)
```

read.phylip *read.phylip*

Description

parsing phylip tree format

Usage

```
read.phylip(file)
```

Arguments

file phylip file

Value

an instance of 'phylip'

Author(s)

Guangchuang Yu

Examples

```
phyfile <- system.file("extdata", "sample.phy", package="treeio")
read.phylip(phyfile)
```

read.phylip.seq *read.phylip.seq*

Description

read aligned sequences from phylip format

Usage

```
read.phylip.seq(file)
```

Arguments

file phylip file, currently only sequential format is supported

Value

DNABin object

Author(s)

Guangchuang Yu

References

<http://evolution.genetics.washington.edu/phylip/doc/sequence.html>

`read.phylip.tree` *read.phylip.tree*

Description

parse tree from phylip file

Usage

`read.phylip.tree(file)`

Arguments

`file` phylip file

Value

phylo or multiPhylo object

Author(s)

Guangchuang Yu

`read.phyloxml` *read.phyloxml*

Description

`read.phyloxml`

Usage

`read.phyloxml(file)`

Arguments

`file` phyloxml file

Value

treedata class or treedataList class

Examples

```
xmlfile1 <- system.file("extdata/phyloxml", "test_x2.xml", package="treeio")
px1 <- read.phyloxml(xmlfile1)
px1
xmlfile2 <- system.file("extdata/phyloxml", "phyloxml_examples.xml", package="treeio")
px2 <- read.phyloxml(xmlfile2)
px2
```

read.r8s

read.r8s

Description

parse output from r8s

Usage

```
read.r8s(file)
```

Arguments

file r8s output log file

Value

multiPhylo object

Author(s)

Guangchuang Yu

Examples

```
read.r8s(system.file("extdata/r8s", "H3_r8s_output.log", package="treeio"))
```

| | |
|------------|-------------------|
| read.raxml | <i>read.raxml</i> |
|------------|-------------------|

Description

parse RAxML bootstrapping analysis output

Usage

```
read.raxml(file)
```

Arguments

file RAxML bootstrapping analysis output

Value

treedata object

Author(s)

Guangchuang Yu

Examples

```
raxml_file <- system.file("extdata/RAxML", "RAxML_bipartitionsBranchLabels.H3", package="treeio")
read.raxml(raxml_file)
```

| | |
|--------------|---------------------|
| read.treeqza | <i>read.treeqza</i> |
|--------------|---------------------|

Description

read.treeqza

Usage

```
read.treeqza(treeqza, node.label = "label", ...)
```

Arguments

treeqza the qiime2 output file contained tree file.
node.label parse node label as 'label' or 'support' value.
... additional parameter, passed to 'read.tree'.

Value

phylo tree object or treedata object when node.label was parsed 'support'.

Examples

```
qzaf1 <- system.file("extdata/qiime2treeqza", "fasttree-tree.qza", package="treeio")
qzaf2 <- system.file("extdata/qiime2treeqza", "iqt-tree.qza", package="treeio")
qzaf3 <- system.file("extdata/qiime2treeqza", "raxml-cat-tree.qza", package="treeio")
tr1 <- read.treeqza(qzaf1)
tr1
tr2 <- read.treeqza(qzaf2)
tr2
tr3 <- read.treeqza(qzaf3)
tr3
# parse node label as 'support' value.
qzaf4 <- system.file("extdata/qiime2treeqza", "raxml-cat-bootstrap-tree.qza", package="treeio")
tr4 <- read.treeqza(qzaf4, node.label="support")
tr4
```

reexports

Objects exported from other packages

Description

These objects are imported from other packages. Follow the links below to see their documentation.

ape [as.phylo](#), [is.rooted](#), [Nnode](#), [Ntip](#), [read.nexus](#), [read.tree](#), [root](#), [rtree](#), [write.nexus](#), [write.tree](#)

dplyr [full_join](#), [inner_join](#)

magrittr [%<>%](#), [%>%](#)

rlang [.data](#)

tibble [as_tibble](#), [tibble](#)

tidytree [ancestor](#), [as.phylo](#), [as.treedata](#), [child](#), [drop.tip](#), [get.data](#), [get.fields](#), [isTip](#), [MRCA](#), [nodeid](#), [nodelab](#), [offspring](#), [parent](#), [rootnode](#), [treedata](#)

rename_taxa

rename_taxa

Description

rename tip label of phylogenetic tree

Usage

```
rename_taxa(tree, data, key = 1, value = 2)
```

Arguments

| | |
|-------|---|
| tree | tree object, either treedata or phylo |
| data | data frame |
| key | column in data that match tip label (use 1st column by default) |
| value | column in data for rename tip label (use 2nd column by default) |

Value

tree object

Author(s)

Guangchuang Yu

Examples

```
tree <- rtree(3)
d <- data.frame(old = paste0('t', 1:3), new = LETTERS[1:3])
rename_taxa(tree, d)
rename_taxa(tree, d, old, new)
```

| | |
|--------------|---------------------|
| rescale_tree | <i>rescale_tree</i> |
|--------------|---------------------|

Description

rescale branch length of tree object

Usage

```
rescale_tree(tree_object, branch.length)
```

Arguments

| | |
|---------------|---------------------------------|
| tree_object | tree object |
| branch.length | numerical features (e.g. dN/dS) |

Value

update tree object

Author(s)

Guangchuang Yu

| | |
|-----|-------------------|
| spt | <i>spt method</i> |
|-----|-------------------|

Description

spt method

Usage

```
spt(x, from, to, weights = NULL, ...)
```

Arguments

| | |
|---------|--|
| x | a igraph object |
| from | a specific node of network. |
| to | other nodes of the network, length of it must be larger than 2. |
| weights | a numeric vector giving edge weights or a character. If this is NULL and the graph has a weight edge attribute, then the attribute is used. If this is NA then no weights are used even if the graph has a weight attribute. If this is a character, the graph has the edge attribute which is numeric, then it will be used, default is NULL. |
| ... | additional parameters |

Value

phylo object

Examples

```
library(igraph)
set.seed(123)
g <- igraph::sample_gnp(100, .1) %>%
  set_edge_attr(name='weight', value=abs(rnorm(E(.),3)))
tr1 <- spt(g, from = 6, to=V(g), weights = 'weight')
tr1
tr2 <- spt(g, from = 6, to = V(g), weights = NA)
tr2
```

| | |
|-------------|--------------------|
| write.beast | <i>write.beast</i> |
|-------------|--------------------|

Description

Export treedata object to BEAST NEXUS file. This function was adopted and modified from ape::write.nexus

Usage

```
write.beast(treedata, file = "", translate = TRUE, tree.name = NULL)
```

Arguments

| | |
|-----------|---|
| treedata | treedata object, list of treedata, phylo, or list of phylo |
| file | output file. If file = "", print the output content on screen |
| translate | whether to translate taxa labels |
| tree.name | names of the trees, NULL to use existing tree names |

Value

output file or file content on screen

Author(s)

Guangchuang Yu

Examples

```
nhxfile <- system.file("extdata/NHX", "phyldog.nhx", package="treeio")
nhx <- read.nhx(nhxfile)
write.beast(nhx)
```

| | |
|--------------------|---------------------------|
| write.beast.newick | <i>write.beast.newick</i> |
|--------------------|---------------------------|

Description

Export treedata object to BEAST Newick file. This is useful for making BEAST starting trees with metadata

Usage

```
write.beast.newick(
  treedata,
  file = "",
  append = FALSE,
  digits = 10,
  tree.prefix = ""
)
```

Arguments

| | |
|-------------|---|
| treedata | treedata object |
| file | output file. If file = "", print the output content on screen |
| append | logical. Only used if the argument 'file' is the name of file (and not a connection or "lcmd"). If 'TRUE' output will be appended to 'file'; otherwise, it will overwrite the contents of file. |
| digits | integer, the indicating the number of decimal places, default is 10. |
| tree.prefix | character the tree prefix, default is "". |

Value

output file or file content on screen

Author(s)

Guangchuang Yu

Examples

```
nhxfile <- system.file("extdata/NHX", "phyldog.nhx", package="treeio")
nhx <- read.nhx(nhxfile)
write.beast.newick(nhx)
```

write.jplace

write.jplace

Description

Export jplace object to jplace file.

Usage

```
write.jplace(x, outfile)
```

Arguments

x a jplace object.
outfile the output file name

Examples

```
jp <- system.file("extdata", "sample.jplace", package="treeio")  
tr1 <- read.jplace(jp)  
outfile <- tempfile()  
write.jplace(tr1, outfile)  
tr2 <- read.jplace(outfile)  
tr2
```

write.jtree

write.jtree

Description

Export treedata object to json tree file

Usage

```
write.jtree(treedata, file = "")
```

Arguments

treedata treedata object
file output file. If file = "", print the output content on screen

Value

output file or file content on screen

Author(s)

Guangchuang Yu

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