Package ‘LeafAngle’
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Type Package
Title Analysis and Visualization of Plant Leaf Angle Distributions
Version 1.2-1
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Description A leaf angle distribution is a special distribution that is defined between 0 and 90 degrees, and a number of distributions are used to characterize the leaf angle distribution in real plant canopies. This package includes methods to fit distributions to data, visualize the fit, and compare fits of nine different distributions.
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LeafAngle-package  
*Functions for fitting and displaying leaf angle distributions*

**Description**

A number of standard distributions to fit to (plant) leaf angle distributions: a special kind of distribution where $0 \leq \text{angle} \leq 90$ (degrees). Based on the list of distributions summarized by Wang et al. (2007). Uses maximum-likelihood to find parameters, determines best fitting distributions, and includes some simple plotting methods.

**Details**

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**Author(s)**

Remko Duursma <remkoduursma@gmail.com>

**References**


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angledist  
*Creates object of class angledist*

**Description**

Creates a leaf angle distribution object. Other functions in the LeafAngle package use this type of object quite conveniently. Nearly all distributions summarized in Wang et al. (2007) are implemented.

**Usage**

angledist(distribution, distpars = NA)
drawsample

Arguments

distribution One of the distributions. Currently included are 'ellipsoid', 'rotatedell', 'twoparbeta', 'spherical', 'planophile', 'extremophile', 'erectophile', 'uniform', and 'plagiophile'.
distpars A vector of parameters for the distribution. See Details.

Details

Only three of the distributions take a parameter, these are 'ellipsoid' and 'rotatedell', and 'twoparbeta'. For the first two, the parameter X needs to be provided, for the 'twoparbeta' the parameters alphamean and tvar (see Wang et al. 2007).

Value

An object of class AngleDist. Simply a list of components, in this usage only two are set: distribution and distpars. Other components are set when fitting a distribution to data, see fitdistribution.

Author(s)

Remko Duursma

References


See Also

fitdistribution, fitalldistributions

Examples

mydist <- angledist('ellipsoid', 1.1)
plot(mydist)

drawsample Simulate from a leaf angle distribution

Description

Uses rejection sampling to generate deviates from any of the supported leaf angle distributions.

Usage

drawsample(obj, n = 25, degrees = FALSE, ...)
Arguments

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Value

A vector of angles (0 - 90 degrees).

Author(s)

Remko Duursma

References


See Also

fitdistribution, fitalldistributions

Description

This dataset gives an example of a set of leaf angles for a Eucalyptus tree, growing in Richmond, NSW, Australia.

Usage

eteret

Format

A vector with 965 observations

References

Data courtesy of David Ellsworth. Please do not use this dataset in publications.
Description

Fits all distributions, returns an object of a special class. Prints nicely to show the statistic of the fit, and which one is the 'best fit'.

Usage

fitalldistributions(anglesL fitmethod = 'loglik',
                 distributions = c('twoparbeta', 'ellipsoid', 'rotatedell', 'planophile',
                                    'erectophile', 'plagiophile', 'extremophile', 'spherical', 'uniform'), ...)  

Arguments

angles Vector of angles (0 - 90 degrees)
fitmethod 'loglik' or 'chisq'.
distributions By default, all implemented distributions.
... Further parameters to fittheta (none as of now).

Details

In most cases, the two-parameter beta distribution provides the best fit, because of greater flexibility.

Value

Object of class angledistlist, which has print and plot methods.

Author(s)

Remko Duursma

References


See Also

fitdistribution
Examples

```r
# Built-in example data
data(eteret)

# Fit all built-in distributions:
fit1 <- fitalldistributions(eteret)
fit1

# Plot one of the fitted distributions:
plot(fit1$allfits$planophile)
```

---

**fitdistribution**  
*Fits a leaf angle distribution*

**Description**

Fits one of nine leaf angle distributions to data, using either log-likelihood (the preferred method), or a method based on minimizing the chi-squared statistic. This latter method is included to be consistent with Wang et al. (2007), as well as others.

A leaf angle distribution is a distribution valid for 0 <= x <= 90.

**Usage**

```r
fitdistribution(angles, distribution, fitmethod = c("loglik", "chisq"),
  ellipsmethod = 2, degrees = TRUE, ...)
```

**Arguments**

- `angles` Vector of leaf angles (0-90 degrees, or 0 - pi/2 radians)
- `distribution` Name of the distribution. Currently included are 'ellipsoid', 'rotatedell', 'twoparbeta', 'spherical', 'planophile', 'extremophile', 'erectophile', 'uniform', and 'plagiophile'.
- `fitmethod` Method to fit the distribution, either "loglik" (log-likelihood) or "chisq" (chi-squared statistic).
- `ellipsmethod` If distribution='ellipsoid', and ellipsmethod=1, the method reported by Wang et al. 2007 is used. Not recommended.
- `degrees` If TRUE, the default, the sample of angles is in degrees, otherwise radians.
- `...` Other parameters passed to `ftheta`.

**Details**

See `drawsample` to simulate from a fitted leaf angle distribution, and `fitalldistributions` for a convenience function to fit all built-in distributions to one dataset.
Value

Returns an object of class ‘angledist’. Methods exist for print, summary, and plot. See Examples.

Author(s)

Remko Duursma

References


See Also

fitdistribution, fitalldistributions

Examples

# Some leaf angle data:
data(eteret)

# Fit the ellipsoidal distribution:
f <- fitdistribution(eteret, "ellipsoid")
f

# Standard plot, histogram with fitted density:
plot(f)

ftheta

Density and cumulative probability functions for leaf angle distributions

Description

ftheta is the density function, Ftheta gives the cumulative probability of a leaf angle, given some distribution. Useful in plotting curves, otherwise not typically needed by user (see fitdistribution instead.

Usage

fthetacum(angles, degrees = TRUE, ...)  

fthetadf(angle, angledistobj=NA, degrees=FALSE, distribution, distpars=NA)  

ftheta(distpars=NA, ...)

---
Arguments

angles  Vector of leaf angles (0-90 degrees)
angle   Leaf angle (degrees)
degrees Logical.
angledistobj  Object of class 'angledist'.
distribution Name of distribution.
distpars   Parameters.
...       None.

Value

A vector of densities or probabilities.

Author(s)

Remko Duursma

References


See Also

fitdistribution, fitalldistributions

Description

Two functions that report the chi-squared statistic, or the log-likelihood of a particular distribution, given a sample of leaf angles. No need to be called by the user. Simply use fitdistribution, which finds the parameters of the distribution by minimizing either chi-squared or log-likelihood.

Usage

chisqfit(angles, distribution, distpars=NA, ...)
loglikfit(angles, distribution, distpars=NA, ...)

Arguments

angles  Vector of angles (0-90 degrees).
distribution One of the nine distributions. See angledist
distpars    Vector of parameters
...       Further parameters passed to ftheta.
Author(s)

Remko Duursma

References


See Also

fitdistribution, fitalldistributions

plot.angledist  
Plots object of class angledist

Description

More

Usage

## S3 method for class 'angledist'
plot(x, 
ylim=NULL, 
add=FALSE, 
linecol="blue", 
xlab=expression(leaf~angle~~(""^"o"")), 
ylab="Density", 
main=NA,...)

Arguments

x  angledist object (see angledist).
ylim  limits for y-axis
add  logical; whether to add curve to existing plot.
linecol  color of line
xlab,ylab  Labels for X and Y axes
main  A title for the plot (optional).
...  Further parameters passed to hist

Details

Plots a histogram of the data used to fit the distribution (if available), and a curve of the density function (in an attractive blue color).
Author(s)
Remko Duursma

References

Examples

```r
# Fit a distribution;
data(eteret)
myfit <- fitdistribution(eteret, "ellipsoid")

# Plot it.
plot(myfit)
```

plot.angledistlist

Plots object of class angledistlist

Description
Makes a plot for every distribution that was fit to the data.

Usage

```r
## S3 method for class 'angledistlist'
plot(x, makepdf=FALSE, ...)
```

Arguments

- `x` angledistlist object
- `makepdf` Logical. If TRUE, produces a pdf with one plot per page.
- `...` Further parameters passed to hist.

Details
Plots a histogram of the data used to fit the distribution (if available), and a curve of the density function (in an attractive blue color), one for each distribution.
print.angledist

Author(s)
Remko Duursma

References

See Also
plot.angledist

Examples

# Fit all distribution;
data(eteret)
myfits <- fitalldistributions(eteret)

# Plot it.
plot(myfits)

# And look at the results,
myfits

print.angledist Displays an object of class angledist

Description
A print method for objects of class angledist.

Usage
## S3 method for class 'angledist'
print(x,...)

Arguments

x Object of class angledist
...
None.

Author(s)
Remko Duursma
See Also

angledist

\section*{print.angledistlist}

Displays an object of class angledist

Description

A print method for objects of class angledistlist.

Usage

\begin{verbatim}
## S3 method for class 'angledistlist'
print(x,...)
\end{verbatim}

Arguments

- \textit{x} Object of class angledistlist
- \textit{...} None.

Author(s)

Remko Duursma

\section*{summary.angledist}

Summarizes object of class angledist

Description

Summarize an object of class angledist.

Usage

\begin{verbatim}
## S3 method for class 'angledist'
summary(object,...)
\end{verbatim}

Arguments

- \textit{object} Object of class angledist
- \textit{...} None.

Author(s)

Remko Duursma

See Also

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