Package 'PPTcirc'

January 20, 2025

Type Package

Title Projected Polya Tree for Circular Data

Version 0.2.3

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Description Provides functionality for the prior and posterior projected Polya tree for the analysis of circular data
(Nieto-Barajas and Nunez-Antonio (2019) <arXiv:1902.06020>).

License GPL-3

Encoding UTF-8

LazyData true

Depends R (>= 2.10)

RoxygenNote 7.2.1

Imports circular, stats, graphics, progress, methods

URL https://github.com/Karlampm/PPTcirc

BugReports https://github.com/Karlampm/PPTcirc/issues

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

Date/Publication 2022-08-30 08:10:16 UTC

Contents

`deer` *Time of the day when a deer was observed*

Description

Temporal activity information (time of the day in radians) when a camera detected the appearance of a deer at El Triunfo biosphere in Mexico in 2015 data provided by Eduardo Mendoza from *Universidad Michoacana de San Nicolas de Hidalgo*, Mexico.

Usage

```
data(deer)
```

Format

A vector of 115 observations (in radians).

References

Nieto-Barajas, L.E. & Nunez-Antonio, G. (2019). Projected Polya tree. https://arxiv.org/pdf/1902.06020.pdf

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`dsimpostppt` *Posterior projected Polya Tree distribution*

Description

Performs posterior inference for a given a circular dataset with the Projected Polya Tree via a MCMC algorithm.

Usage

```
dsimpostppt(datafile,units = c("radians", "degrees", "hours"),
mm = 4, mu = c(0, 0), sig = 1, aa = 1, delta = 1.1,
it = 500, bi = 50, ti = 2, kapa = 0.5, ha = 0, hm = 0,
c0 = 1, c1 = 2, iota = 6, mu0 = 0, taum = 1, control.circular = list())
```

Arguments

datafile	the data from which the estimate is to be computed. The object is circular or will be coerced to circular.
units	units of the support: "radians", "degrees" or "hours".
mm	number of finite levels of the Polya tree
mu	mean vector of the projected bivariate normal centering distribution.
sig	precision of the projected bivariate normal centering distribution.
aa	alpha. Standard deviation parameter of the projected Polya tree.
delta	controls of the speed at which the variances of the branching probabilities move down in the tree, rho(m)=m^delta.
it	number of iterations for MCMC.
bi	number of burn in iterations for MCMC.
ti	thinning parameter of the MCMC chain.
kapa	tunning parameter in the MH proposal distribution for the latent resultants R.
ha	logical. If TRUE alpha will be assigned Ga(c0,c1) hyper-prior distribution.
hm	logical. If TRUE mu will be assigned N(mu0,taum) independent hyper-prior distributions for each coordinate.
c0, c1	shape and rate hyper-parameters of the gamma prior distribution for alpha. These will be used only when ha=1.
iota	tunning parameter in the MH proposal distribution for alpha.
mu0, taum	mean and precision hyper-parameters of the independent normal prior distribution for each coordinate of mu. These will be used only when hm=1.
control.circular	the attribute used to coerced the resulting. object. See circular.

Value

An object of class postppt.circ whose underlying structure is a list containing the following components:

x	points where the density is evaluated.
predictive	predicitive density estimated with the projected Polya tree.
quantile2.5 quantile97.5	lower and upper 95% credible interval limits.
stats	descriptive statistics: mean direction and concentration of each MCMC density.
cpo	conditional predictive ordinate statistic for the data.
LMPL	logarithm of the pseudo marginal likelihood statistic.
aa.sims	vector of simulated alphas when ha=1.
mu.sims	matrix of simulated bivariate means when hm=1.
acceptancerate	Acceptance rate of MH step for the latent resultants.
acceptancerate_aa	Acceptance rate of MH step for alpha.
data	original dataset.

References

Nieto-Barajas, L.E. & Nunez-Antonio, G. (2019). Projected Polya tree. https://arxiv.org/pdf/1902.06020.pdf

See Also

postppt.plot, postppt.summary

Examples

```
data(tapir)
#It is advised to increase the number of iterations for a better fitting
z1 <- dsimpostppt(tapir, units = "radians", it = 5, ti =1, bi=0, ha = 1, hm =1)
class(z1)
length(z1$acceptancerate)
z1$acceptancerate

postppt.summary(z1)
postppt.plot(z1, plot.type= "line" , ylim = c(0,0.8))
```

---

dsimpriorppt *Prior projected Polya tree distribution*

Description

Simulates paths of prior projected Polya tree distributions centered around a projected normal distribution.

Usage

```
dsimpriorppt(nsim = 5, mm = 4,mu = c(0, 0),
sig = 1, ll = 100, aa = 1, delta = 1.1, units = "radians")
```

Arguments

nsim	integer indicating the number of simulations.
mm	integer indicating the number of finite levels of the Polya tree.
mu	mean vector of the projected bivariate normal distribution.
sig	standard deviation of the projected bivariate normal distribution. We advise to always use sig = 1.
ll	number of equally spaced points at which the projected distribution will be evaluated.
aa	alpha. Precision parameter of the Polya tree.
delta	controls of the speed at which the variances of the branching probabilities move down in the tree, rho(m)=m^delta.
units	units of the support: "radians", "degrees" or "hours".

Value

An object with class priorppt.circ whose underlying structure is a list containing the following components:

`x`	points where the density is evaluated.
`ppt.sims`	simulated density paths of the prior projected Polya tree.
`stats`	descriptive statistics: mean direction and concentration of each simulated density.

References

Nieto-Barajas, L.E. & Nunez-Antonio, G. (2019). Projected Polya tree. https://arxiv.org/pdf/1902.06020.pdf

See Also

`priorppt.plot`, `priorppt.summary`

Examples

```
z <- dsimpriorppt(mu = c(5,5), nsim = 5, units = "radians")
priorppt.plot(z, plot.type = "line")
summary(z$stats)
```

---

peccary *Time of the day when a peccary was observed*

Description

Temporal activity information (time of the day in radians) when a camera detected the appearance of a peccary at El Triunfo biosphere in Mexico in 2015 data provided by Eduardo Mendoza from *Universidad Michoacana de San Nicolas de Hidalgo*, Mexico.

Usage

```
data(peccary)
```

Format

A vector of 16 observations (in radians).

References

Nieto-Barajas, L.E. & Nunez-Antonio, G. (2019). Projected Polya tree. https://arxiv.org/pdf/1902.06020.pdf

postppt.plot *Plot method for posterior projected Polya tree*

Description

Plots posterior projected Polya tree estimates.

Usage

```
postppt.plot(postppt.circ,
plot.type = c("circle", "line", "summary", "a.sim", "mu.sim", "cpos"),
interval = TRUE, control.circular = list(),
shrink = 1, tol = 0.04,sep = 0.025, ylim = NULL, xlim = NULL, breaks = 12)
```

Arguments

postppt.circ	object returned by the dsimpostppt function.
plot.type	type of plot to be drawn: "circle" for circular plot, "line" for linear plot, "summary" for boxplot of mean direction and concentration, "cpos" for cpos scatter plot, "a.sim" for summary plots of simulated alphas and "mu.sim" for summary plots of simulated mu1 and mu2.
interval	logical. If TRUE 95% credible intervals will be shown in the circular and linear plots.
control.circular	attributes of circular object in order to draw the circle.See circular.
shrink	parameter that controls the size of the plotted circle. Default is 1. Larger values shrink the circle, while smaller values enlarge the circle.
tol	proportion of white space at the margins of plot.
sep	constant used to specify the distance between stacked points. Default is 0.025;smaller values will create smaller spaces
ylim	range to be encompassed by "y" axis.
xlim	range to be encompassed by "x" axis.
breaks	one of: a vector giving the breakpoints between histogram cells, a function to compute the vector of breakpoints, a single number giving the number of cells for the histogram, a character string naming an algorithm to compute the number of cells, a function to compute the number of cells.

See Also

plot, plot.density.circular

Examples

```
 z2 <- dsimpostppt(deer, units = "radians", it = 10, ti =1, bi=0, ha = 1)
postppt.plot(z2, plot.type= "line" , shrink = 1.4, tol = 1.2, ylim = c(0,0.6))
postppt.summary(z2)
postppt.plot(z2, plot.type= "cpos" )
postppt.plot(z2, plot.type= "circle" , shrink = 1.4, tol = 1.2)
```

`postppt.summary` *Summary statistics for the post projected Polya tree*

Description

Extracts mean, quantiles 2.5% and 97.5% of the mean direction and concentration.

Usage

```
postppt.summary(postppt.circ)
```

Arguments

`postppt.circ`	object returned by `dsimpostppt` function.

Value

table of descriptive statistics.

Examples

```
z1 <- dsimpostppt(tapir, units = "radians", it = 5, ti =1, bi=0)
postppt.summary(z1)
```

`priorppt.plot` *Plot method for prior projected Polya tree*

Description

Plots density paths of simulated prior projected Polya tree, mean direction and concentration.

Usage

```
priorppt.plot(priorppt.circ, n.path="all",
plot.type = c("circle", "line", "summary"),control.circular = list(),
shrink=1, tol = 0.04,ylim)
```

Arguments

priorppt.circ	object returned by dsimpriorppt function.
n.path	"all" plots all the simulated paths or numeric parameter indicates the simulation path of the priorppt.circ object that will be plot.
plot.type	type of plot to be drawn: "circle" for circular plot, "line" for linear plot and "summary" for boxplot of mean direction and concentration.
control.circular	attributes of circular object in order to draw the circle.See circular.
shrink	parameter that controls the size of the plotted circle. Default is 1. Larger values shrink the circle, while smaller values enlarge the circle.
tol	proportion of white space at the margins of plot.
ylim	range to be encompassed by "y" axis.

Value

Circular plot of simulated paths when plot.type = "circle". Linear plot of simulated paths for plot.type = "line". Boxplot of mean direction and concentration for plot.type = "summary"

See Also

plot, plot.density.circular

Examples

```
z <- dsimpriorppt(mu = c(0,1), nsim = 5, units = "degrees")
priorppt.plot(z, plot.type = "circle",shrink =0.5, tol = 4)
priorppt.plot(z, plot.type = "line")
priorppt.plot(z, plot.type = "summary")
```

---

priorppt.summary *Summary for the prior projected Polya tree simulations*

Description

Mean, quantiles 2.5% and 97.5% of the mean direction and concentration.

Usage

```
priorppt.summary(priorppt.circ, units = "radians")
```

Arguments

priorppt.circ	object returned by dsimpriorppt function.
units	units of the support: "radians", "degrees" or "hours".

Value

Table of descriptive statistics for mean direction and concentration.

Examples

```
z <- dsimpriorppt(mu = c(-1,0), nsim = 5, units = "hours")
priorppt.summary(z)
```

---

tapir *Time of the day when a tapir was observed*

Description

Temporal activity information (time of the day in radians) when a camera detected the appearance of a tapir at El Triunfo biosphere in Mexico in 2015 data provided by Eduardo Mendoza from *Universidad Michoacana de San Nicolas de Hidalgo*, Mexico.

Usage

```
data(tapir)
```

Format

A vector of 35 observations (in radians).

References

Nieto-Barajas, L.E. & Nunez-Antonio, G. (2019). Projected Polya tree. https://arxiv.org/pdf/1902.06020.pdf

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