Package ‘DPtree’

June 19, 2018

Title  Dirichlet-Based Polya Tree
Version  1.0.1
Depends    R (>= 3.3.1)
License    MIT + file LICENSE
Encoding   UTF-8
LazyData   true
Imports    MCMCpack, stats, plyr, MASS, Rdpack
RdMacros   Rdpack
RoxygenNote 6.0.1
NeedsCompilation no
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Repository  CRAN
Date/Publication  2018-06-19 09:17:55 UTC

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**dDPTreeRealize**  
*The distribution function for realized distribution from D-P tree.*

**Description**

dDPTreeRealize returns the value of density function of realized distribution from D-P tree at certain given point on copula space.

**Usage**

dDPTreeRealize(d, x)

**Arguments**

- **d**  
  A $2^m$ by $2^m$ matrix, $m$ being the approximating level. Normalized measures for all $2^m$ by $2^m$ sub-partitions on copula space given by the realized distribution from D-P tree, as returned by `dptreedensity`.

- **x**  
  An array of dimension $n$ by 2. The points on copula space for density function evaluation. Should be between 0 and 1.

**Value**

An array of length $n$. The values of PDF of the input D-P tree distribution evaluated at the input points.

**References**


**Examples**

dDPTreeRealize(DPTreePMeanDensity(DPTreePrior(m=2, z=1)),c(0.5,0.5))

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**DPTreeDensity**  
*Calculating sub-partition probability measures for a realized distribution from D-P tree.*

**Description**

DPTreeDensity returns the probablity measures in the finest sub-partitions of a realized distribution from D-P tree prior/posterior.

**Usage**

DPTreeDensity(Z)
Arguments

`Z`  
An array of dimension of $2^m$ by $2^m$ by $m$, $m$ being the approximation level. Realized Z’s for all partitions at each level, as returned by `RealizeDPTree`.

Value

A $2^m$ by $2^m$ matrix. Normalized measures for all $2^m$ by $2^m$ sub-partitions on copula space given by the realized distribution from D-P tree.

References


Examples

```r
dp.rlz <- RealizeDPTree(DPTreePrior(m=2, z=1))
DPTreeDensity(dp.rlz)
```

DPTreePMeanDensity  
Calculating sub-partition probability measures for the posterior mean distribution from D-P tree.

Description

DPTreePMeanDensity returns the probability measures in the finest sub-partitions of the posterior mean from D-P tree.

Usage

DPTreePMeanDensity(prior)

Arguments

prior  
A list. D-P tree specification. Should be in same format as returned from `DPTreePrior` or `DPTreePosterior`.

Value

A $2^m$ by $2^m$ matrix. Normalized measures for all $2^m$ by $2^m$ sub-partitions on copula space given by the posterior mean distribution from D-P tree.

References

DPTreePosterior

D-P tree posterior updating from a single copula observation.

Description

DPTreePosterior returns the D-P tree posterior given input copula data.

Usage

DPTreePosterior(x, prior, w = 1)

Arguments

x  An array of length 2. Single copula data observation. Each element should be between 0 and 1.
prior  A list. Should be in same format as returned from DPTreePrior.
w  A positive number. Weight of data for posterior updating. Default 1.

Value

A list.

a  An array containing the hyperparameters of D-P trees.

References


Examples

nsim = 1
rho = 0.9
data1 <- MASS::mvrnorm(n=nsim, mu=rep(0, 2), Sigma=matrix(c(1, rho, rho, 1), 2, 2))
data2 <- stats::pnorm(data1)
DPTreePosterior(x=data2, prior=DPTreePrior(m=4, z=1))
**DPTreePosteriorMulti**  
*D-P tree posterior updating from multiple copula observations.*

**Description**

DPTreePosteriorMulti returns the D-P tree posterior given input copula data.

**Usage**

```r
DPTreePosteriorMulti(x, prior, w = 1)
```

**Arguments**

- **x**: An array of dimension \( n \) by 2. Multiple copula data observations, with each row being a bivariate copula observation. All elements should be between 0 and 1.
- **prior**: A list. Should be in same format as returned from `DPTreePrior`.
- **w**: A positive number or an array of length \( n \). Weight of data for posterior updating. Default 1.

**Value**

A list.

- **a**: An array containing the hyperparameters of D-P trees.

**References**


**Examples**

```r
sim = 10  
rho = 0.9  
data1 <- MASS::mvrnorm(n=sim, mu=rep(0, 2), Sigma=matrix(c(1, rho, rho, 1, 2, 2), 2, 2))  
data2 <- stats::pnorm(data1)  
DPTreePosteriorMulti(x=data2, prior=DPTreePrior(m=4, z=1))
```
**DPTreePrior**  
*Generating the standard D-P Tree prior*

**Description**

DPTreePrior returns a standard D-P Tree prior based on specified hyperparameters.

**Usage**

DPTreePrior(m = 4, z = 1)

**Arguments**

- **m**: A positive integer. The finite approximation level for D-P tree. Default m=4.
- **z**: A positive number. On i-th level, the hyperparameter for D-P tree prior is $z \times i^2$. Default z=1.

**Value**

A list.

- **a**: An array containing the hyperparameters of D-P trees.

**References**


**Examples**

DPTreePrior(m=6, z=1)

---

**pDPTreeRealize**  
The distribution function for realized distribution from D-P tree.

**Description**

pDPTreeRealize returns the value of distribution function of realized distribution from D-P tree at certain given point on copula space.

**Usage**

pDPTreeRealize(d, x)
Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>A $2^m \times 2^m$ matrix, $m$ being the approximating level. Normalized measures for all $2^m \times 2^m$ sub-partitions on copula space given by the realized distribution from D-P tree, as returned by DPTreeDensity.</td>
</tr>
<tr>
<td>x</td>
<td>An array of dimension $n \times 2$. The points on copula space for distribution function evaluation. Should be between 0 and 1.</td>
</tr>
</tbody>
</table>

Value

An array of length $n$. The values of CDF of the input D-P tree distribution evaluated at the input points.

References


Examples

```r
dptreerealize(dptreepmeandensity(dptreeprior(m=R, z=1)),c(0.5,0.5))
```

Description

RealizeDPTree returns a realized (copula) distribution sampled from the input D-P Tree.

Usage

RealizeDPTree(prior)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>prior</td>
<td>A list. Should be in same format as returned from DPTreePrior.</td>
</tr>
</tbody>
</table>

Value

An array of dimension $2^m \times 2^m \times m$. $m$ is the approximation level. Realized Z’s for all partitions at each level. Three dimensions represent two marginals, and the level respectively.

References


Examples

RealizeDPTree(DPTreePrior(m=2, z=1))
SampleDPTreeDensity

Sample a copula observation from a realized distribution from D-P tree.

Description

SampleDPTreeDensity returns a copula sample from a realized distribution from D-P tree.

Usage

SampleDPTreeDensity(nsam, d)

Arguments

nsam A positive integer. The sample size.
d A $2^m$ by $2^m$ matrix, $m$ being the approximating level. Normalized measures for all $2^m$ by $2^m$ sub-partitions on copula space given by the realized distribution from D-P tree, as returned by DPTreeDensity.

Value

An array of dimension nsam by 2. The values of PDF of the input D-P tree distribution evaluated at the input points.

References


Examples

SampleDPTreeDensity(10, DPTreePMeanDensity(DPTreePrior(m=2, z=1)))
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