Package 'bivariate'

May 24, 2019

Title Bivariate Probability Distributions

Version 0.4.1

Date 2019-05-24

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Description Contains convenience functions for constructing, plotting and evaluating bivariate probability distributions, including their probability mass functions, probability density functions and cumulative distribution functions. Supports uniform (discrete and continuous), binomial, Poisson, categorical, normal, bimodal and Dirichlet (trivariate) distributions, and kernel smoothing and empirical cumulative distribution functions.

Depends graphics, stats

Imports intoo, barsurf, mvtnorm, KernSmooth

Suggests probhat, MASS

NeedsCompilation no

Repository CRAN

Date/Publication 2019-05-24 07:50:12 UTC

R topics documented:

`rd_01_uniform` *Discrete and Continuous Uniform Distributions*

Description

Discrete and continuous uniform distributions.

Refer to the vignette for better examples.

Usage

```
dubvpmf (a.X, b.X, a.Y, b.Y)
dubvcdf (a.X, b.X, a.Y, b.Y)

cubvpdf (a.X, b.X, a.Y, b.Y)
cubvcdf (a.X, b.X, a.Y, b.Y)
```

Arguments

`a.X`	Numeric scalar, giving the a value of X.
`b.X`	Numeric scalar, giving the b value of X.
`a.Y`	Numeric scalar, giving the a value of Y.
`b.Y`	Numeric scalar, giving the b value of Y.

Value

Returns functions of the form:

function (x, y) = {...}

Where x and y are integers (discrete case) or numeric vectors (continuous case).

Examples

```
f = dubvpmf (1, 4, 1, 4)

f (1, 1)
```

rd_02_binomial *Binomial Distributions*

Description

Binomial distributions.

Refer to the vignette for better examples.

Usage

```
bnbvpmf (p.X, p.Y, n=1)
bnbvcdf (p.X, p.Y, n=1)
```

Arguments

p.X	Numeric scalar, giving the probability of the first event.
p.Y	Numeric scalar, giving the probability of the second event.
n	Integer scalar, giving the number of trials.

Value

Returns functions of the form:

function (x, y) = {...}

Where x and y are integers.

Examples

```
f = bnbvpmf (0.5, 0.5, 10)

f (4, 4)
```

rd_03_poisson *Poisson Distributions*

Description

Poisson distributions.

Refer to the vignette for better examples and references.

Usage

```
pbvpmf (lambda.1, lambda.2, lambda.3)
pbvcdf (lambda.1, lambda.2, lambda.3)

pbvpmf.2 (mean.X, mean.Y, cov)
pbvcdf.2 (mean.X, mean.Y, cov)
```

Arguments

`lambda.1`	Integer scalar, giving the first lambda parameter.
`lambda.2`	Integer scalar, giving the second lambda parameter.
`lambda.3`	Integer scalar, giving the third lambda parameter.
`mean.X`	Integer scalar, giving the mean (and variance) of X.
`mean.Y`	Integer scalar, giving the mean (and variance) of Y.
`cov`	Integer scalar, giving the covariance of X and Y.

Value

Returns functions of the form:

function (x, y) = {...}

Where x and y are integers.

Examples

```
f = pbvpmf (10, 10, 0)

f (4, 4)
```

`rd_04_categorical` *Categorical Distributions*

Description

Categorical distributions.

Refer to the vignette for better examples.

Usage

```
cbvpmf (z)
```

Arguments

`z`	Numeric matrix of probabilities or frequencies, preferably with row and column names.

Value

Returns a function of the form:

function (x, y) = {...}

Where x and y are integers or strings.

Examples

```
z = matrix (sample (1:16), 4, 4)
f = cbvpmf (z)

f (1, 1)
```

`rd_05_normal` *Normal Distributions*

Description

Normal distributions.

Refer to the vignette for better examples.

Usage

```
nbvpdf (mean.X, mean.Y, sd.X, sd.Y, cor)
nbvcdf (mean.X, mean.Y, sd.X, sd.Y, cor)

nbvpdf.2 (mean.X, mean.Y, var.X, var.Y, cov)
nbvcdf.2 (mean.X, mean.Y, var.X, var.Y, cov)
```

Arguments

`mean.X`	Numeric scalar, giving the mean of X.
`mean.Y`	Numeric scalar, giving the mean of Y.
`sd.X`	Numeric scalar, giving the sd of X.
`sd.Y`	Numeric scalar, giving the sd of Y.
`var.X`	Numeric scalar, giving the variance of X.
`var.Y`	Numeric scalar, giving the variance of Y.
`cor`	Numeric scalar, giving the correlation of X and Y.
`cov`	Numeric scalar, giving the correlation of X and Y.

Value

Returns functions of the form:

function (x, y) = {...}

Where x and y are numeric vectors.

Examples

```
f = nbvpdf (0, 0, 1, 1, 0)

f (0, 0)
```

rd_06_bimodal *Bimodal Distributions*

Description

Bimodal distributions.

Refer to the vignette for better examples.

Usage

```
bmbvpdf (mean.X1, mean.Y1, sd.X1, sd.Y1,
    mean.X2, mean.Y2, sd.X2, sd.Y2)
bmbvcdf (mean.X1, mean.Y1, sd.X1, sd.Y1,
    mean.X2, mean.Y2, sd.X2, sd.Y2)

bmbvpdf.2 (mean.X1, mean.Y1, var.X1, var.Y1,
    mean.X2, mean.Y2, var.X2, var.Y2)
bmbvcdf.2 (mean.X1, mean.Y1, var.X1, var.Y1,
    mean.X2, mean.Y2, var.X2, var.Y2)
```

Arguments

mean.X1	Numeric scalar, giving the mean of the first X component.
mean.Y1	Numeric scalar, giving the mean of the first Y component.
sd.X1	Numeric scalar, giving the sd of the first X component.
sd.Y1	Numeric scalar, giving the sd of the first Y component.
var.X1	Numeric scalar, giving the variance of the first X component.
var.Y1	Numeric scalar, giving the variance of the first Y component.
mean.X2	Numeric scalar, giving the mean of the second X component.
mean.Y2	Numeric scalar, giving the mean of the second Y component.
sd.X2	Numeric scalar, giving the variance of the second X component.
sd.Y2	Numeric scalar, giving the variance of the second Y component.
var.X2	Numeric scalar, giving the variance of the second X component.
var.Y2	Numeric scalar, giving the variance of the second Y component.

Value

Returns functions of the form:

function (x, y) = {...}

Where x and y are numeric vectors.

Examples

```
f = bmbvpdf (3.5, 0, 1, 1, 6.5, 0, 1, 1)

f (0, 0)
```

`rd_07_dirichlet` *Trivariate Dirichlet Distributions*

Description

Trivariate Dirichlet distributions.

Refer to the vignette for better examples.

Usage

```
dtvpdf (alpha.1, alpha.2, alpha.3, tol=0.001)
```

Arguments

`alpha.1`	Numeric scalar, giving the first alpha parameter.
`alpha.2`	Numeric scalar, giving the second alpha parameter.
`alpha.3`	Numeric scalar, giving the third alpha parameter.
`tol`	.

Details

The alpha parameters should be greater than 0.

The x values should sum to approximately 1 (with an error defined by tol) and be in the interval (0, 1).

Value

Returns a function of the form:

function (x1, x2, x3, log=FALSE) = {...}

Where x1, x2 and x3 are numeric vectors.

Examples

```
f = dtvpdf (1, 1, 1)

f (0.3, 0.3, 0.4)
```

rd_08_nonparametric *Nonparametric Distributions*

Description

Kernel density estimation and empirical cumulative distribution functions.

Refer to the vignette for better examples.

Usage

```
kbvpdf (x, y, bw.X, bw.Y)
ebvcdf (x, y)
```

Arguments

x	A vector of x values.
y	A vector of y values.
bw.X	Numeric scalar, giving the X bandwidth.
bw.Y	Numeric scalar, giving the Y bandwidth.

Details

The kbvpdf() function calls the bkde2D() function from the KernSmooth package.

Refer the probhat package for kernel smoothing, more generally.

Value

Returns functions of the form:

function (x, y) = {...}

Where x and y are numeric vectors.

Examples

```
x = rnorm (20)
y = rnorm (20)
f = ebvcdf (x, y)

f (0, 0)
```

rd_09_print_method *Print Method*

Description

Print method for bv (bivariate) objects.

Usage

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

Arguments

x	A bv object.
...	Other arguments.

Details

This method calls the object.summary() function from the intoo package.

Examples

```
f = dubvpmf (1, 4, 1, 4)
f
```

rd_10_plot_methods *Plot Methods*

Description

Plot methods for bv (bivariate) objects.

Usage

```
## S3 method for class 'dubvpmf'
plot(x, use.plot3d=FALSE, xlim, ylim, ..., all=FALSE)
## S3 method for class 'dubvcdf'
plot(x, use.plot3d=FALSE, xlim, ylim, ...)

## S3 method for class 'bnbvpmf'
plot(x, use.plot3d=FALSE, xlim, ylim, ..., all=FALSE)
## S3 method for class 'bnbvcdf'
plot(x, use.plot3d=FALSE, xlim, ylim, ...)

## S3 method for class 'pbvpmf'
```

```
plot(x, use.plot3d=FALSE, xmax, ymax, ..., all=FALSE)
## S3 method for class 'pbvcdf'
plot(x, use.plot3d=FALSE, xmax, ymax, ...)

## S3 method for class 'cbvpmf'
plot(x, use.plot3d, ...)

## S3 method for class 'cubvpdf'
plot(x, use.plot3d=FALSE, npoints=20, xlim, ylim, ..., all=FALSE)
## S3 method for class 'cubvcdf'
plot(x, use.plot3d=FALSE, npoints=20, xlim, ylim, ...)

## S3 method for class 'nbvpdf'
plot(x, use.plot3d=FALSE, npoints=20, xlim, ylim, ..., all=FALSE)
## S3 method for class 'nbvcdf'
plot(x, use.plot3d=FALSE, npoints=20, xlim, ylim, ...)

## S3 method for class 'bmbvpdf'
plot(x, use.plot3d=FALSE, npoints=20, xlim, ylim, ..., all=FALSE)
## S3 method for class 'bmbvcdf'
plot(x, use.plot3d=FALSE, npoints=20, xlim, ylim, ...)

## S3 method for class 'dtvpdf'
plot(x, use.plot3d=FALSE, npoints=20, log=FALSE, ...)

## S3 method for class 'kbvpdf'
plot(x, use.plot3d=FALSE, npoints=30, xlim, ylim, ...)

## S3 method for class 'ebvcdf'
plot(x, use.plot3d=FALSE, mpoints=30, ...)
```

Arguments

x	A bv object.
use.plot3d	If false, a 2d plot, or if true, a 3d plot.
npoints	The number of grid points in each direction. Increase for a smoother surface.
mpoints	The max number of points, for plotting as a step function.
xlim	The x range for the plot.
ylim	The y range for the plot.
xmax	The x range max for the plot.
ymax	The y range max for the plot.
log	If true, plot the log density.
all	If true, plot a two by two grid of both the PMF (or PDF) and CDF using both 2d and 3d plots.
...	Other arguments.

Examples

```
f = dubvpmf (1, 4, 1, 4)
plot (f)
```

---

rd_11_theme *Theme*

Description

Use the bivariate theme.

Usage

```
use.bv.theme ()
```

Details

The .onLoad function (called when the package is loaded) calls this function.

Examples

```
use.bv.theme ()
```

Index