Package ‘PMD’

August 4, 2021

Type Package

Title Computation of Poisson-Multinomial Distribtuions

Version 1.0

Date 2021-08-06

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Description Application of exact and simulation and approximation methods for computing probability density functions, cumulative probabilities of Poisson-Multinomial distributions together with a Poisson-Multinomial random number generator.

License GPL (>= 2)

Encoding UTF-8

Imports mvtnorm, Rcpp

LinkingTo Rcpp, RcppArmadillo

SystemRequirements fftw3(>=3.3)

RoxygenNote 7.1.1

NeedsCompilation yes

Archs i386, x64

R topics documented:

dpmd *Probability Mass of Poisson-Multinomial Distributions*

Description

Computation of probability mass for Poisson-Multinomial Distributions using exact, simulation, approximation methods. Users are allowed to specified a method and can choose to compute single mass point or all mass points. For simulation method, users can also choose the repeating time to enhance the accuracy of outcomes.

Usage

```
dpmd(pp, method = "DFT-CF", vec = c(0, 0, 0, 0, 0), B = 100)
```

Arguments

`pp`	A matrix of probabilities. Each row of pp should add up to 1.
`method`	Method selected by user to compute the probability mass. There are totally 4 methods. DFT-CF: An exact method to calculate all probability mass points of Poisson-Multinomial Distributions via FFT algorithm. simulation: A simulation method calculating all probability mass points. NA by demands: An approximation method using Normal approximation to compute the probability for the 'vec' vector input by user. simulation by demands: The same simulation method as above just to compute single probability mass point as input by user.
`vec`	Result vector(probability mass point) specified by user. eg. pp is 4 times 3 matrix then user might be interested in the probability of getting result: vec=c(0,0,1,2).
`B`	Simulation repeat time.

Value

For a single mass point, dpmd returns a probability. For all probability mass points of a given pp, it returns a multi-dimensional array. To understand this, here is an example: pp=matrix(c(.1, .1, .1, .7, .1, .3, .3, .3, .5, .2, .1, .2), nrow=3, byrow=TRUE) > dpmd(pp) , , 1

[,1] [,2] [,3] [,4] [1,] 0.042 0.090 0.054 0.006 [2,] 0.125 0.148 0.023 0.000 [3,] 0.052 0.022 0.000 0.000 [4,] 0.005 0.000 0.000 0.000

, , 2

[,1] [,2] [,3] [,4] [1,] 0.069 0.084 0.015 0 [2,] 0.138 0.042 0.000 0 [3,] 0.021 0.000 0.000 0 [4,] 0.000 0.000 0.000 0

, , 3

[,1] [,2] [,3] [,4] [1,] 0.030 0.012 0 0 [2,] 0.019 0.000 0 0 [3,] 0.000 0.000 0 0 [4,] 0.000 0.000 0 0 , , 4 [,1] [,2] [,3] [,4] [1,] 0.003 0 0 0 [2,] 0.000 0 0 0 [3,] 0.000 0 0 0 [4,] 0.000 0 0 0

The array value of [1,2,1] = 0.90 means the probability of vecor (0,1,0,2=3-0-1-0) = (0,1,0,2) is 0.9.

Examples

```
pp=matrix(c(.1, .1, .1, .7, .1, .3, .3, .3, .5, .2, .1, .2), nrow=3, byrow=TRUE)
dpmd(pp)
dpmd(pp,"simulation",B=10^3)
dpmd(pp,"NA by demands", vec = c(0,0,1,2))
dpmd(pp,"simulation by demands", vec = c(0,0,1,2), B=10^3)
```

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pmatrix *pmatrix*

Description

pmatrix

Usage

```
pmatrix(n, m)
```

Arguments

n	column dimension
m	row dimension

Value

a randomly generated Poisson multinomial distribution probability matrix.

Examples

```
pp = pmatrix(2,2)
pp
```

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ppmd *cumulative mass function of PMN*

Description

By an input vector x = (x_1,x_2,...), this function compute P(X_1 < x_1, X_2 < x_2, ...)

Usage

```
ppmd(pp, x, method = "DFT-CF", B = 1000)
```

Arguments

pp	input matrix of probabilities
x	input result vector
method	method selected by users to compute the cumulative mass probabilities.
B	repeating time

Value

prob

Examples

```
pp=matrix(c(.1, .1, .1, .7, .1, .3, .3, .3, .5, .2, .1, .2), nrow=3, byrow=TRUE)
ppmd(pp,c(3,2,1,3))
```

`rpmd` *generate random number from PMD*

Description

generate random number from PMD

Usage

```
rpmd(pp)
```

Arguments

`pp`	input matrix of probabilities

Value

the random number vector generated from PMD.

Examples

```
pp=matrix(c(.1, .1, .1, .7, .1, .3, .3, .3, .5, .2, .1, .2), nrow=3, byrow=TRUE)
rpmd(pp)
```

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