Package 'multicmp'

October 13, 2022

Type Package

Title Flexible Modeling of Multivariate Count Data via the Multivariate Conway-Maxwell-Poisson Distribution

Version 1.1

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Description A toolkit containing statistical analysis models motivated by multivariate forms of the Conway-Maxwell-Poisson (COM-Poisson) distribution for flexible modeling of multivariate count data, especially in the presence of data dispersion. Currently the package only supports bivariate data, via the bivariate COM-Poisson distribution described in Sellers et al. (2016) <doi:10.1016/j.jmva.2016.04.007>. Future development will extend the package to higher-dimensional data.

Imports stats, numDeriv

URL http://dx.doi.org/10.1016/j.jmva.2016.04.007

BugReports https://github.com/diagdavenport/multicmp/issues

License GPL-3

LazyData TRUE

RoxygenNote 6.0.1

NeedsCompilation no

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Repository CRAN

Date/Publication 2018-06-29 12:08:59 UTC

R topics documented:

accidents *Shunter accidents*

Description

The number of accidents incurred by 122 shunters in two consecutive year periods, namely 1937 - 1942 and 1943 - 1947

Usage

```
accidents
```

Format

A dataframe with 122 rows and 2 variables:

x Number of shunter accidents between 1937 and 1942

y Number of shunter accidents between 1943 and 1947

Source

A. Arbous, J.E. Kerrick, Accident statistics and the concept of accident proneness, Biometrics 7 (1951) 340-432.

dbivCMP *The Bivariate Conway-Maxwell-Poisson Distribution*

Description

Density for the Bivariate Conway-Maxwell-Poisson (CMP) distribution

Usage

```
dbivCMP(lambda, nu, bivprob, x, y, maxit)
```

Arguments

lambda	Mean/rate parameter under Poisson model.
nu	Dispersion parameter.
bivprob	Bivariate probabilities, p00, p01, p10, p11.
x	x values
y	y values
maxit	Number of terms used to truncate infinite sum calculations.

References

Sellers KF, Morris DS, Balakrishnan N (2016) Bivariate Conway-Maxwell-Poisson Distribution: Formulation, Properties, and Inference, Journal of Multivariate Analysis 150:152-168.

Examples

```
dbivCMP(lambda=10, nu=1, bivprob=c(0.4, 0.2, 0.3, 0.1), x=2, y=3, maxit = 100)
#this is equivalent to the pmf P(X=2,Y=3) of a bivariate Poisson
##with lambda1=3, lambda2=2, lambda3=1
```

`multicmpests` *Bivariate COM-Poisson Parameter Estimation*

Description

`multicmpests` computes the maximum likelihood estimates of a bivariate COM-Poisson distribution (based on the model described in Sellers et al. (2016)) for given count data and conducts a test for significant data dispersion, relative to a bivariate Poisson model. The bivariate Poisson case is addressed via the bivpois package by Karlis and Ntzoufras (2009).

Usage

```
multicmpests(data, max = 100, startvalues = NULL)
```

Arguments

`data`	A two-column dataset of counts.
`max`	Truncation term for infinite summation associated with the Z function. See Sellers et al. (2016) for details.
`startvalues`	A vector of starting values for maximum likelihood estimation. The values are read as follows: c(lambda, nu, p00, p10, p01, p11). The default is c(1,1, 0.25, 0.25, 0.25, 0.25).

Value

`multicmpests` will return a list of four elements: $par (Parameter Estimates), $negll (Negative Log-Likelihood), $LRTbpd (Dispersion Test Statistic), and $pbpd (Dispersion Test P-Value).

References

Sellers KF, Morris DS, Balakrishnan N (2016) Bivariate Conway-Maxwell-Poisson Distribution: Formulation, Properties, and Inference, Journal of Multivariate Analysis 150:152-168.

Karlis D., Ntzoufras I. (2009) bivpois: Bivariate Poisson Models Using the EM Algorithm, Version 0.50-3.1. http://cran.wustl.edu/web/packages/bivpois/index.html

Examples

```
x1 <- c(3,2,5,4,1)
x2 <- c(0,4,1,0,1)
ex.data <- cbind(x1,x2)

# starting close to the optimum for sake of run time
multicmpests(ex.data, startvalues = c(12.5 , 1.7 , 0, 0.25, 0.75, 0))
```

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