Package: imprecise101 (via r-universe)

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Title Introduction to Imprecise Probabilities

Version 0.2.2.4

Description An imprecise inference presented in the study of Walley (1996) <doi:10.1111/j.2517-6161.1996.tb02065.x> is one of the statistical reasoning methods when prior information is unavailable. Functions and utils needed for illustrating this inferential paradigm are implemented for classroom teaching and further comprehensive research. Two imprecise models are demonstrated using multinomial data and 2x2 contingency table data. The concepts of prior ignorance and imprecision are discussed in lower and upper probabilities. Representation invariance principle, hypothesis testing, decision-making, and further generalization are also illustrated.

License GPL-3

Encoding UTF-8

RoxygenNote 7.1.2

Suggests covr, knitr, rmarkdown

VignetteBuilder knitr

Imports stats, tolerance, graphics, pscl

NeedsCompilation no

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Contents

`dbetabinom` *Beta-Binomial Distribution*

Description

This function computes the predictive posterior density of the outcome of interest under the imprecise Dirichlet prior distribution. It follows a beta-binomial distribution.

Usage

```
dbetabinom(i, M, x, s, N, tA)

pbetabinom(M, x, s, N, y)
```

Arguments

`i`	number of occurrences of event A in the M future trials
`M`	number of future trials
`x`	number of occurrence of event A in the N previous trials
`s`	learning parameter
`N`	total number of previous trials
`tA`	prior probability of event A under the Dirichlet prior
`y`	maximum number of occurrences of event A in the M future trials

Value

`dbetabinom` returns a scalar value of density and `pdetabinom` returns a list of scalars corresponding to the lower and upper probabilities of the distribution.

Examples

```
pbetabinom(M=6, x=1, s=1, N=6, y=0)
```

`dbetadif` *Distribution of Difference of Two Proportions*

Description

Distribution of Difference of Two Proportions

Usage

```
dbetadif(x, a1, b1, a2, b2)
```

Arguments

`x`	difference of two beta distributions
`a1`	shape 1 parameter of Beta distribution with control
`b1`	shape 2 parameter of Beta distribution with control
`a2`	shape 1 parameter of Beta distribution with treatment
`b2`	shape 2 parameter of Beta distribution with treatment

Value

`betadif` gives a scalar value of density.

References

Chen, Y., & Luo, S. (2011). A few remarks on 'Statistical distribution of the difference of two proportions' by Nadarajah and Kotz, Statistics in Medicine 2007; 26 (18): 3518-3523. Statistics in Medicine, 30(15), 1913-1915.

`ibm` *Impreicse Beta Model*

Description

This function computes lower and upper posterior probabilities under an imprecise Beta model when prior information is not available.

Usage

```
ibm(n = 10, m = 6, s0 = 2, showplot = TRUE, xlab1 = NA, main1 = NA)
```

Arguments

n	total of trials
m	number of observations realized
s0	learning parameter
showplot	logical, TRUE by default
xlab1	x axis text
main1	main title text

Value

ibm returns data.frame containing posterior probabilities on the mean parameter space.

References

Walley, P. (1996), Inferences from Multinomial Data: Learning About a Bag of Marbles. Journal of the Royal Statistical Society: Series B (Methodological), 58: 3-34. https://doi.org/10.1111/j.2517-6161.1996.tb02065.x

Examples

```
tc <- seq(0,1,0.1)
s <- 2
ibm(n=10, m=6)
```

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idm *Imprecise Dirichlet Model*

Description

This function computes lower and upper posterior probabilities under an imprecise Dirichlet model when prior information is not available.

This function searches for the lower and upper bounds of a given level of the highest posterior density interval under the imprecise Dirichlet prior.

Usage

```
idm(nj, s = 1, N, tj = NA_real_, k, cA = 1)

hpd(
  alpha = 3,
  beta = 5,
  p = 0.95,
  tolerance = 1e-04,
  maxiter = 100,
  verbose = FALSE
)
```

Arguments

`nj`	number of observations in the j th category
`s`	learning parameter
`N`	total number of drawings
`tj`	mean probability associated with the j th category
`k`	number of elements in the sample space
`cA`	the number of elements in the event A
`alpha`	shape1 parameter of beta distribution
`beta`	shape2 parameter of beta distribution
`p`	level of credible interval
`tolerance`	level of error allowed
`maxiter`	maximum number of iterations
`verbose`	logical option suppressing messages

Value

`idm` returns a list of lower and upper probabilities.

`p.lower`	Minimum of imprecise probabilities
`p.upper`	Maximum of imprecise probabilities
`v.lower`	Variance of lower bound
`v.upper`	Variance of upper bound
`s.lower`	Standard deviation of lower bound
`s.upper`	Standard deviation of upper bound
`p`	Precise probabilty
`p.delta`	Degree of imprecision

hpd gives a list of scalar values corresponding to the lower and upper bounds of highest posterior probability density region.

References

Walley, P. (1996), Inferences from Multinomial Data: Learning About a Bag of Marbles. Journal of the Royal Statistical Society: Series B (Methodological), 58: 3-34. https://doi.org/10.1111/j.2517-6161.1996.tb02065.x

Examples

```
idm(nj=1, N=6, s=2, k=4)
x <- hpd(alpha=3, beta=5, p=0.95) # c(0.0031, 0.6587) when s=2
# round(x,4); x*(1-x)^5
```

Index