Package 'imPois'

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Title Imprecise Inference for Poisson Sampling Models

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Description Tools performing an imprecise inference for estimating the parameter of Poisson sampling model. Extended the original work done in the PhD thesis of Lee (2014). The theory of imprecise probabilities introduced by Peter Walley in 1991 becomes the basis of this inferential framework.

Depends R (>= 2.7.0)

Suggests knitr

Imports geometry, grDevices, graphics, stats, utils, rgl

License GPL (>= 2)

Encoding UTF-8

LazyData true

RoxygenNote 5.0.1

Type Package

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VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

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R topics documented:

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bary2cart *Conversion from bary to cartesian*

Description

Conversion from barycentric coordinates to cartesian coordinates

Usage

```
bary2cart(x)

bary2cart3d(x)
```

Arguments

x	point coordinate information

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cpm *Conjugate Prior Measure*

Description

A conjugate prior measure on the canonical parameter is defined in the form of three-parameter exponenitial family of probability measure. cpm1 computes a normalizing constant. dcpm and pcpm give density and distribution functions for the canonical variable t. Also see the 'Details'.

Usage

```
cpm(t, xi2, xi1, xi0, log = FALSE)

cpm1(t, xi2, xi1, xi0, log = FALSE)

dcpm(x, pars, log.p = FALSE)

pcpm(q, pars, lower.tail = TRUE, log.p = FALSE)

et.pdf(y = NULL, pars)

ey(y = NULL, pars)
```

```
et.rt(y = NULL, pars)

et.la(y = NULL, pars, const = 1000)

et2.pdf(y = NULL, pars)

et0.pdf(y = NULL, pars)

mpm(m, xi2, xi1, xi0, log = FALSE)

mpm1(m, xi2, xi1, xi0, log = FALSE)

dmpm(x, pars, log.p = FALSE)

em.pdf(y = NULL, pars)

em.rt(y = NULL, pars)

mpm.ztrunc(m, xi2, xi1, xi0, log = FALSE)

mpm1.ztrunc(m, xi2, xi1, xi0, log = FALSE)

dmpm.ztrunc(x, pars, log.p = FALSE)

em.pdf.ztrunc(y = NULL, pars)

em.rt.ztrunc(y = NULL, pars)
```

Arguments

t	variable
xi2	precision
xi1	linear component
xi0	effective sample size
log	logical
x	quantile
pars	parameters of length 3
log.p	logical; if TRUE, probabilities p are given as $log(p)$
q	quantiles
lower.tail	logical; if TRUE, probabilities are $P[X \leq x]$ otherwise, $P[X > x]$
y	a vector of observations, by default, NULL
const	constant
m	mean parameter

Details

A formal definition of this conjugate prior measure is given by

$$e^(- \xi_2\theta^2 + \xi_1\theta - \xi_0 \exp(\theta))$$

, where θ is a canonical variable ranged from `-Inf` to `Inf`, ξ_2 is a precision parameter, ξ_1 is a linear component, and ξ_0 is an effective sample size.

Author(s)

Chel Hee Lee <chl948@mail.usask.ca>

References

Lee, C.H. (2014) Imprecise Prior for Imprecise Inference on Poisson Sampling Models, PhD Thesis, University of Saskatchewan

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`fn.evfn` *Hyperparamter Optimization*

Description

Score and graident functions are defined

Usage

```
fn.evfn(x)

gr.evfn(x)
```

Arguments

`x`	parameter needs to be optimized

`iprior` *Characterizing Imprecise Prior*

Description

A set of prior distributions is characterized as an imprecise prior for inference. See 'Details'.

Usage

```
iprior(ui, ci, pmat)
```

Arguments

ui	constraint matrix (k x p), see below.
ci	constrain vector of length k, see below.
pmat	matrix (k x p) containig coordinate information in d-dimensions.

Details

A convex set of hyperparameters is charcterized using a set of linear inequalities. `grDevices::chull` and `geometry::convhulln` functions are used to search for extreme points of this convex set.

Examples

```
## 2-dims (xi2=0, xi1, xi0)
lc0 <- list(lhs=rbind(diag(2), -diag(2)), rhs=c(0,0,-1,-1))
op <- iprior(ui=rbind(diag(2), -diag(2)), ci=c(0,0,-1,-1))
op <- iprior(ui=rbind(c(1,0),c(0,1),c(-1,-1)), ci=c(0,0,-5))
op <- iprior(ui=rbind(c(1,0),c(0,1),c(0,-1),c(1,1),c(-2,-1)),
             ci=c(1,2,-8,5,-14)) # (3,8),(1,8), (1,4),(3,2)(6,2)

## 3-dimes (xi2, xi1, xi0)
op <- iprior(ui=rbind(c(1,0,0), c(-1,0,0), c(0,1,0), c(0,-1,0), c(0,0,1)),
             ci=c(-0.5, -1, -2, -2, 0))
op <- iprior(ui=rbind(c(1,0), c(-1,0), c(0,1), c(0,-1)),
             ci=c(0.5, -1, -2, -2))
lc0 <- cbind(rbind(c(1,0,0), c(-1,0,0), c(0,1,0), c(0,-1,0), c(0,0,1),
             c(0,0,-1)), c(0.5, -1, -2, -2,0,-1))
iprior(pmat=lc0)
lc0 <- rbind(c(-2,1,0), c(2,1,0), c(-2,0.5,0), c(2,0.5,0))
lc0 <- rbind(c(1,2,0), c(1,-2,0), c(0.5,-2,0), c(0.5,2,0))
iprior(pmat=lc0)
```

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plot.impinf *Plotting Imprecise Objects*

Description

Generic function for plotting of `imprecise` objects

Generating a probability box

Usage

```
## S3 method for class 'impinf'
plot(x, after.obs = FALSE, ...)

pbox(x, xmin = -4, xmax = 4, ncdfs = 5, x.by = 0.05, xmar, ...)
```

Arguments

x	an object for which a plot is needed.
after.obs	logical indicating imprecise prior or posterior.
...	additional arguments affecting the plot produced.
xmin	lower limit of quantile
xmax	upper limit of quantile
ncdfs	number of CDFs
x.by	argument used in seq on cdf
xmar	adjustment for label

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print.summary.impinf *Print Summarized Objects*

Description

Printing impinf objects

Usage

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

Arguments

x	an object used to select a method
...	further arguments passed to or from other methods

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summary.impinf *Summaries of* impinf *object*

Description

Summarizing outputs produced from update.impinf.

Usage

```
## S3 method for class 'impinf'
summary(object, ...)
```

Arguments

object	an object for which a summary is needed.
...	additional arguments affecting the summary produced.

update.impinf *Applying Bayes Rule*

Description

The Bayes rule is applied to an imprecise prior and produce an imprecise posterior.

Usage

```
## S3 method for class 'impinf'
update(object, y = NULL, wrt = c("canonical", "mean"), ...)

update2.impinf(object, y = NULL, ...)
```

Arguments

object	an object for which an update is needed
y	vector of observations
wrt	parameterization method with respect to canonical or mean
...	further arguments passed to methods

Examples

```
# 2-dimensions
lc0 <- list(lhs=rbind(diag(2), -diag(2)), rhs=c(0,0,-1,-1))
op <- iprior(ui=rbind(diag(2), -diag(2)), ci=c(0,0,-1,-1))
op <- iprior(ui=rbind(c(1,0),c(0,1),c(-1,-1)), ci=c(0,0,-5))
op <- iprior(ui=rbind(c(1,0),c(0,1),c(0,-1),c(1,1),c(-2,-1)),
             ci=c(1,2,-8,5,-14)) # (3,8),(1,8), (1,4),(3,2)(6,2)
op1 <- update(op, y=NULL)

# 3-dimensions
lc0 <- rbind(c(1,2,0), c(1,-2,0), c(0.5,-2,0), c(0.5,2,0))
op <- iprior(pmat=lc0)
op1 <- update(op, y=NULL)
```

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