

Package ‘cPseudoMaRg’

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Type Package

Title Constructs a Correlated Pseudo-Marginal Sampler

Version 1.0.1

Description The primary function `makeCPMSampler()` generates a sampler function which performs the correlated pseudo-marginal method of Deligiannidis, Doucet and Pitt (2017) <[arXiv:1511.04992](https://arxiv.org/abs/1511.04992)>. If the `'rho='` argument of `makeCPMSampler()` is set to 0, then the generated sampler function performs the original pseudo-marginal method of Andrieu and Roberts (2009) <[DOI:10.1214/07-AOS574](https://doi.org/10.1214/07-AOS574)>. The sampler function is constructed with the user's choice of prior, parameter proposal distribution, and the likelihood approximation scheme. Note that this algorithm is not automatically tuned--each one of these arguments must be carefully chosen.

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RoxygenNote 7.1.1

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

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isBadNum	<i>checks if a log-density evaluation is not a valid number</i>
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Description

checks if a log-density evaluation is not a valid number

Usage

```
isBadNum(num)
```

Arguments

num evaluation of a log-density

Value

TRUE or FALSE

Examples

```
isBadNum(NaN)
```

makeCPMSampler	<i>correlated pseudo-marginal: generates functions that output a big vector</i>
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Description

correlated pseudo-marginal: generates functions that output a big vector

Usage

```
makeCPMSampler(  
  paramKernSamp,  
  logParamKernEval,  
  logPriorEval,  
  logLikeApproxEval,  
  yData,  
  numU,  
  numIters,  
  rho = 0.99,  
  storeEvery = 1,  
  nansInLLFatal = TRUE  
)
```

Arguments

paramKernSamp function(theta) -> theta proposal
 logParamKernEval function(oldTheta, newTheta) -> logDensity.
 logPriorEval function(theta) -> logDensity.
 logLikeApproxEval function(y, thetaProposal, uProposal) -> logApproxDensity.
 yData the observed data
 numU integer number of u samples
 numIters integer number of MCMC iterations
 rho correlation tuning parameter (-1,1)
 storeEvery increase this integer if you want to use thinning
 nansInLLFatal terminate the entire chain on NaNs, or simply disregard sample

Value

vector of theta samples

Examples

```

# sim data
realTheta1 <- .2 + .3
realTheta2 <- .2
realParams <- c(realTheta1, realTheta2)
numObs <- 10
realX <- rnorm(numObs, mean = 0, sd = sqrt(realTheta2))
realY <- rnorm(numObs, mean = realX, sd = sqrt(realTheta1 - realTheta2))
# tuning params
numImportanceSamps <- 1000
numMCMCIters <- 1000
randomWalkScale <- 1.5
recordEveryTh <- 1
sampler <- makeCPMSampler(
  paramKernSamp = function(params){
    return(params + rnorm(2)*randomWalkScale)
  },
  logParamKernEval = function(oldTheta, newTheta){
    dnorm(newTheta[1], oldTheta[1], sd = randomWalkScale, log = TRUE)
    + dnorm(newTheta[2], oldTheta[2], sd = randomWalkScale, log = TRUE)
  },
  logPriorEval = function(theta){
    if( (theta[1] > theta[2]) & all(theta > 0)){
      0
    }else{
      -Inf
    }
  },
  },

```

```

logLikeApproxEval = function(y, thetaProposal, uProposal){
  if( (thetaProposal[1] > thetaProposal[2]) & (all(thetaProposal > 0))){
    xSamps <- uProposal*sqrt(thetaProposal[2])
    logCondLikes <- sapply(xSamps,
                          function(xsamp) {
                            sum(dnorm(y,
                                       xsamp,
                                       sqrt(thetaProposal[1] - thetaProposal[2]),
                                       log = TRUE)) })
    m <- max(logCondLikes)
    log(sum(exp(logCondLikes - m))) + m - log(length(y))
  }else{
    -Inf
  }
},
realY, numImportanceSamps, numMCMCIters, .99, recordEveryTh
)
res <- sampler(realParams)

```

mean.cpmResults

calculates the posterior mean point estimate

Description

calculates the posterior mean point estimate

Usage

```
## S3 method for class 'cpmResults'
mean(x, ...)
```

Arguments

x a cpmResults object
 ... arguments to be passed to or from methods.

Value

a vector of parameter estimates (posterior mean)

`plot.cpmResults` *plots a cpmResults object*

Description

plots a cpmResults object

Usage

```
## S3 method for class 'cpmResults'  
plot(x, ...)
```

Arguments

x a cpmResults object
... arguments to be passed to or from methods.

`print.cpmResults` *prints a cpmResults object*

Description

prints a cpmResults object

Usage

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

Arguments

x a cpmResults object
... arguments to be passed to or from methods.

Value

the same cpmResults object

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