Package 'dsample'

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Type Package

Title Discretization-based Direct Random Sample Generation

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Description The package provides two discretization-based Monte Carlo algorithms, namely the Fu-Wang algorithm and the Wang-Lee algorithm, for random sample generation from a high dimensional distribution of complex structure. The normalizing constant of the target distribution needs not to be known.

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R topics documented:

`dsample-package` *Discretization-based Direct Random Sample Generation*

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Author(s)

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References

Fu, J. C. and Wang, L. (2002). A random-discretization based Monte Carlo sampling method and its application. Methodology and Computing in Applied Probability, 4, 5-25.

Wang, L. and Fu, J. (2007). A practical sampling approach for a bayesian mixture model with unknown number of components. Statistical Papers, 48, 631-653.

Wang, L. and Lee, C.H. (2008). A discretization-based efficient random sampling algorithm. Working Paper, Department of Satistics, University of Manitoba.

Examples

```
## The following example is taken from West (1993, page 414).
## West, M. (1993). Approximating posterior distributions by mixture. Journal of the
## Royal Statistical Society - B, 55, 409-422.

## More accurate results can be achieved by increasing the number of dicretization points
## and the number of contours.  The default value for the number of discretization points
## is 1e7 and for the number of contours is 1e5

x1 <- runif(1e5)
x2 <- runif(1e5)
val <- (x1*(1-x2))^5 * (x2*(1-x1))^3 * (1-x1*(1-x2)-x2*(1-x1))^37
support <- as.data.frame(cbind(val, x1, x2))

## Applying the Fu-Wang algorithm
out1 <- sample.fw(X=support, nc=1e4, n=1e3)
summary(out1)

## Applying the Wang-Lee algorithm
out2 <- sample.wl(X=support, nc=1e4, n=1e3)
summary(out2)
```

`sample.fw` *Random Sample Generation Through The Fu-Wang Algorithm*

Description

`sample.fw` generates a sample of size `n` from the target density funciton (up to a normalizing constant) using the Fu-Wang algorithm

Usage

```
sample.fw(X, nc = 10000, n = 1000)
```

Arguments

`X`	a `data.frame` or a `matrix`. See 'Details'.
`nc`	a positive integer, the number of contours. See 'Details'.
`n`	a non-negative integer giving the user specified sample size.

Details

`X` has the number of rows equals to the number of discrete base points. In each row, the first element contians the funcitonal value of the target density and the rest elements are the coordinates at which the density is evaluated.

Value

`sample.fw` gives the drawn sample as a `data.frame` with the number of rows equals to the specified size `n` and number of columns equals to `ncol(x)-1`.

Author(s)

Liqun Wang and Chel Hee Lee

References

Fu, J. C. and Wang, L. (2002). A random-discretization based Monte Carlo sampling method and its application. Methodology and Computing in Applied Probability, 4, 5-25.

Wang, L. and Fu, J. (2007). A practical sampling approach for a bayesian mixture model with unknown number of components. Statistical Papers, 48(4):631-653.

Wang, L. and Lee, C.H. (2008). A discretization-based efficient random sampling algorithm (Working paper), Department of Satistics, University of Manitoba, Canada

See Also

`sample.wl`

Examples

```
## The following example is taken from West (1993, page 414).
## West, M. (1993). Approximating posterior distributions by mixture. Journal of the Royal
##   Statistical Society - B, 55, 409-422.

## More accurate results can be achieved by increasing the number of dicretization points
## and the number of contours. The default value for the number of discretization points
## is 1e7 and for the number of contours is 1e5.


x1 <- runif(1e5)
x2 <- runif(1e5)
val <- (x1*(1-x2))^5 * (x2*(1-x1))^3 * (1-x1*(1-x2)-x2*(1-x1))^37
support <- as.data.frame(cbind(val, x1, x2))

summary(sample.fw(X=support, nc=1e4, n=1e3))
```

`sample.wl` *Random Samples Generation Through The Wang-Lee Algorithm*

Description

`sample.wl` generates a sample of specified size `n` from the target density funciton (up to a normalizing constant) based on the Wang-Lee algorithm

Usage

```
sample.wl(X, nc = 10000, n = 1000, wconst = NULL)
```

Arguments

`X`	a `data.frame` or a `matrix`. See 'Details'.
`nc`	a positive integer, the number of contours. See 'Details'.
`n`	a non-negative integer, the desired sample size.
`wconst`	a real number between 0 and 1. See 'Details'.

Details

`X` has the number of rows equals to the number of discrete base points. In each row, the first element contians the funcitonal value of the target density and the rest elements are the coordinates at which the density is evaluated.

`wconst` is a constant for adjusting the volumn of the last contour.

Value

`sample.wl` gives the drawn sample as a `data.frame` with number of rows equals the specified size `n` and number of columns equals `ncol(x)-1`.

Note

sample.fw

Author(s)

Liqun Wang and Chel Hee Lee

References

Fu, J. C. and Wang, L. (2002). A random-discretization based Monte Carlo sampling method and its application. Methodology and Computing in Applied Probability, 4, 5-25.

Wang, L. and Fu, J. (2007). A practical sampling approach for a bayesian mixture model with unknown number of components. Statistical Papers, 48(4):631-653.

Wang, L. and Lee, C.H. (2008). A discretization-based efficient random sampling algorithm (Working paper), Department of Satistics, University of Manitoba, Canada

Examples

```
## The following example is taken from West (1993, page 414).
## West, M. (1993). Approximating posterior distributions by mixture. Journal of the Royal
##   Statistical Society - B, 55, 409-422.


## More accurate results can be achieved by increasing the number of dicretization points
## and the number of contours.  The default value of the number of discretization points
## is 1e7 and for the number of contours is 1e5


x1 <- runif(1e5)
x2 <- runif(1e5)
val <- (x1*(1-x2))^5 * (x2*(1-x1))^3 * (1-x1*(1-x2)-x2*(1-x1))^37
support <- as.data.frame(cbind(val, x1, x2))

summary(sample.fw(X=support, nc=1e4, n=1e3))
```

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summary.samplefwl *Generating Basic Summary Statistics of Marginal Distributions*

Description

Producing basic summary statistics (the mean, the standard deviation and the first five modes) from the sample drawn via either the Fu-Wang algorithm or the Wang-Lee algorithm, for all marginal distributions of the target distribution.

Usage

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

Arguments

`object`	a `data.frame`, contains the sample drawn via either the Fu-Wang algorithm or the Wang-Lee algorithm
`...`	dot-dot-dot arguments

Author(s)

Liqun Wang and Chel Hee Lee

Examples

```
##---- Should be DIRECTLY executable !! ----
##-- ==>  Define data, use random,
##--or do  help(data=index)  for the standard data sets.

## The function is currently defined as
function (object, ...)
{
    cat("\nMeans: \n")
    print(round(sapply(object, mean), 4))
    cat("\nStandard deviations: \n")
    print(round(sapply(object, mean), 4))
    cat("\nFirst five modes: \n")
    print(round(object[1:5, ], 4))
  }
```

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