

# Package ‘SI’

September 23, 2018

**Type** Package

**Title** Stochastic Integrating

**Version** 0.2.0

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**Description** An implementation of four stochastic methods of integrating in R, including:

1. Stochastic Point Method (or Monte Carlo Method);
2. Mean Value Method;
3. Important Sampling Method;
4. Stratified Sampling Method.

It can be used to estimate one-dimension or multi-dimension integration by Monte Carlo methods. And the estimated variance (precision) is given.

Reference: Cafilisch, R. E. (1998) <doi:10.1017/S0962492900002804>.

**License** GPL

**Encoding** UTF-8

**LazyData** true

**Date** 2018-09-22

**Depends** R (>= 3.0.1), stats (>= 3.3.2)

**Suggests** knitr, rmarkdown, testthat

**VignetteBuilder** knitr

**RoxygenNote** 6.0.1

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2018-09-23 04:10:10 UTC

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SI.ISM                      *Important Sampling Method*

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**Description**

Important Sampling Method

**Usage**

```
SI.ISM(h, g, G_inv, N, min_G = 0, max_G = 1)
```

**Arguments**

h	Density function to be integrated
g	Sampling density function
G_inv	The inverse function of sampling distribution function
N	The number of trials
min_G	The min value of G
max_G	The max value of G

**Value**

I	Approximated integration
Var	Estimated variance

**Examples**

```
## To integrate exp(x) from -1 to 1
## Use the sampling density (3/2+x)/3
set.seed(0)
h <- function(x){
  exp(x)
}
N <- 100000
g <- function(x){return((3/2+x)/3)}
G_inv <- function(y){return(sqrt(6*y+1/4)-3/2)}
ISMresult <- SI.ISM(h,g,G_inv,N)
I3 <- ISMresult[[1]]
VarI3 <- ISMresult[[2]]
```

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SI.MVM

*Mean Value Method*

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**Description**

Mean Value Method

**Usage**

SI.MVM(h, from, to, N)

**Arguments**

h	Density function to be integrated
from	The start point
to	The end point
N	The number of trials

**Value**

I	Approximated integration
Var	Estimated variance

**Examples**

```
## To integrate exp(x) from -1 to 1
set.seed(0)
h <- function(x){
  exp(x)
}
N <- 100000
MVMresult <- SI.MVM(h,-1,1,N)
I2 <- MVMresult[[1]]
VarI2 <- MVMresult[[2]]
```

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SI.SPM

*Stochastic Point Method*

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**Description**

Stochastic Point Method

**Usage**

SI.SPM(h, from, to, M, N)

**Arguments**

h	Density function to be integrated
from	The start point
to	The end point
M	The upper bound of h(x) in [from,to]
N	The number of trials

**Value**

I	Approximated integration
Var	Estimated variance

**Examples**

```
## To integrate exp(x) from -1 to 1
set.seed(0)
h <- function(x){
  exp(x)
}
N <- 100000
SPMresult <- SI.SPM(h,-1,1,exp(1),N)
I1 <- SPMresult[[1]]
VarI1 <- SPMresult[[2]]
```

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 SI.SSM

*Stratified Sampling Method*


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**Description**

Stratified Sampling Method

**Usage**

```
SI.SSM(h, from, to, level, N)
```

**Arguments**

h	Density function to be integrated
from	The start point
to	The end point
level	Stratification, number of intervals
N	The number of trials

**Value**

I	Approximated integration
Var	Estimated variance

**Examples**

```
## To integrate exp(x) from -1 to 1
set.seed(0)
h <- function(x){
  exp(x)
}
N <- 100000
SSMresult <- SI.SSM(h,-1,1,10,N)
I4 <- SSMresult[[1]]
VarI4 <- SSMresult[[2]]
```

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