

ARS Manual

December 10, 2013

ARSPackage

ARSPackage: an Adaptive Rejection Sampler

Description

Final project for Statistics 243, an R package that performs adaptive rejection sampling, first proposed by Gilks and Wild in 1992.

Details

Package:	ARSPackage
Type:	Package
Version:	1.0
Date:	2013-12-13
Depends:	methods, numDeriv
Collate:	'adapt_reject.r', 'ars_methods.r'

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References

Gilks, Wild, 1992. <http://faculty.chicagobooth.edu/hedibert.lobes/teaching/ccis2010/1992GilksWild.pdf>.

See Also

https://bitbucket.org/lfelberg/stat243_final_proj
<https://github.com/paciorek/stat243-fall-2013/tree/master/project>

Cadapt_reject_sample *The adapt_reject class*

Description

This class contains all the methods used to perform an AR sampling.

Slots

n: Variable of class "numeric", n, containing the number of points to sample, taken as user input.
f_x: Function of class "function", containing the $f(x)$ to sample from, taken as user input.
bounds: Variable of class "numeric", n, containing the bounds of the function, taken as user input.
output: Variable of class "vector", containing sampled points to return to user.
h_at_x: Variable of class "vector", containing computed $\log(f(x))$ values at all x values
hprime_at_x: Variable of class "vector", containing computed derivative of $\log(f(x))$ values at all x values
z: Variable of class "vector", containing abscissae of upper bound function.
samples: Variable of class "vector", containing random numbers generated by $s(x)$ and unif.
x: Variable of class "vector", containing x values used in ARS.
weights: Variable of class "vector", containing sampled points to return to user.
output: Variable of class "numeric", containing sampled points to return to user.
mat_sorted: Variable of class "matrix", containing x values, their corresponding h and h prime values, sorted by increasing x.

a_r_s *The adapt_reject function*

Description

This calls the class Cadapt_reject_sample and its methods. The vector of samples is accessible via *ans output*.

Usage

```
a_r_s(n_samples, fx, bounds = c(-Inf, Inf), ...)
```

Arguments

n_samples: Number of samples desired from distribution
fx: Function to sample from
bounds: Bounds of function of interest. The default is an unbounded function

Value

S4 adapt_reject_sample object; a vector containing n points sampled from the $f(x)$ distribution

ev_h	<i>Cadapt_reject_sample ev_h</i>
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Description

Cadapt_reject_sample ev_h

Arguments

object [Cadapt_reject_sample](#) object

gen_x	<i>Cadapt_reject_sample generating first two points</i>
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Description

Cadapt_reject_sample generating first two points

Arguments

object [Cadapt_reject_sample](#) object

initialize	<i>Cadapt_reject_sample initialization: method to intialize the ARS class for sampling. Will store values input from user and will also initialize empty arrays for all other slots.</i>
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Description

Cadapt_reject_sample initialization: method to initialize the ARS class for sampling. Will store values input from user and will also initialize empty arrays for all other slots.

Arguments

object [Cadapt_reject_sample](#) object
n numeric determining the number of samples to obtain
f_x function for distribution to sample from
bounds vector of distribution bounds

lower	<i>Cadapt_reject_sample lower</i>
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Description

This calculates the lower hull for x^* which we sample from the sampling method for adapt/reject.

Arguments

object	Cadapt_reject_sample object
x	vector that we have evaluated h_x for
x_star	numeric random number for adapt/reject

Value

l_{x_star} numeric the lower hull for x^*

s_x	<i>Cadapt_reject_sample s(x)</i>
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Description

Function to normalize the upper bounds of $\log(f(x))$

Arguments

object	Cadapt_reject_sample object
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sampling	<i>Cadapt_reject_sample sample</i>
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Description

[Cadapt_reject_sample sample](#)

Arguments

object	Cadapt_reject_sample object
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show	<i>Cadapt_reject_sample show</i>
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Description

[Cadapt_reject_sample show](#)

Arguments

object	Cadapt_reject_sample object
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update	<i>Cadapt_reject_sample update</i>
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Description

Cadapt_reject_sample update

Arguments

object [Cadapt_reject_sample](#) object

upper	<i>Cadapt_reject_sample upper</i>
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Description

This calculates the upper hull for x^* which we sample from the sampling method for adapt/reject.

Arguments

object [Cadapt_reject_sample](#) object
 x vector that we have evaluated h_x for
 x_star numeric random number for adapt/reject
 z vector abscissa of all points

Value

u_x_star numeric the upper hull for x^*

validity_ars	<i>Validity checks for S4 adapt_reject_sample object: want to ensure at creation that the number of samples desired is a positive integer</i>
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Description

Validity checks for S4 adapt_reject_sample object: want to ensure at creation that the number of samples desired is a positive integer

Usage

```
validity_ars(object)
```

Arguments

object An adapt_reject_sample object

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*Topic **package, rejection sampling**

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