

# Package ‘simukde’

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**Type** Package

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**Title** Simulation with Kernel Density Estimation

## Description

Generates random values from a univariate and multivariate continuous distribution by using kernel density estimation based on a sample. Duong (2017) <[doi:10.18637/jss.v021.i07](https://doi.org/10.18637/jss.v021.i07)>, Christian P. Robert and George Casella (2010 ISBN:978-1-4419-1575-7) <[doi:10.1007/978-1-4419-1576-4](https://doi.org/10.1007/978-1-4419-1576-4)>.

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**URL** <https://github.com/galaamn/simukde>

**BugReports** <https://github.com/galaamn/simukde/issues>

**Depends** R (>= 2.14.0)

**Imports** ks, mvtnorm, parallel, stats, MASS, methods

**Suggests** testthat, datasets

**License** GPL (>= 3) | file LICENSE

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**NeedsCompilation** no

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**Repository** CRAN

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find_best_fit	<i>Find The Best Fitting Distribution</i>
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### Description

It finds the best fitting distribution from supported univariate continuous distributions for given data.

### Usage

```
find_best_fit(
  x,
  positive = FALSE,
  plot = TRUE,
  legend.pos = "topright",
  dlc = NULL,
  dlw = 1,
  ...
)
```

### Arguments

x	a numeric vector; data.
positive	a logical constant; distribution type.
plot	a logical constant. If TRUE (default), a histogram and density lines are drawn.
legend.pos	a character string. Indicates the legend position and must be one of "bottom-right", "bottom", "bottomleft", "left", "topleft", "top", "topright" (default), "right" and "center".
dlc	a vector; probability density line colors for supported (up to 7) distributions. If unspecified, the rainbow color palette will be used.
dlw	a numerical constant; probability density line width.
...	Further arguments and parameters for the function <a href="#">hist</a> , particularly, main title and axis labels. However, the parameter <code>freq</code> is not able to override.

### Details

This function is supported following univariate distributions:

- for positive random variables: Log normal, Exponential, Gamma and Weibull.
- for all random variables: Normal, Cauchy, Log normal, Exponential, Gamma, Weibull and Uniform.

Legends of the plot are ordered by p-values of the test.

**Value**

A list containing the following items:

**distribution** the name of the best fitting distribution.

**ks.statistic** the Kolmogorov-Smirnov test statistic for the distribution.

**p.value** the p-value of the test.

**summary** results similar to above for other distributions.

**x** given data.

**n** the sample size.

**References**

1. William J. Conover (1971). Practical Nonparametric Statistics. New York: John Wiley & Sons. Pages 295–301.
2. Venables, W. N. and Ripley, B. D. (2002) Modern Applied Statistics with S. Fourth edition. Springer.

**See Also**

[ks.test](#), [fitdistr](#), [hist](#)

**Examples**

```
petal.length <- datasets::iris$Petal.Length[datasets::iris$Species == "setosa"]
simukde::find_best_fit(x = petal.length, positive = TRUE)
```

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simukde

*Simulation with Kernel Density Estimation*

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**Description**

The simukde package provides a function which generates random values from a univariate and multivariate continuous distribution by using kernel density estimation based on a sample. The function uses the Accept-Reject method.

**Note**

Funding: This package has been done within the framework of the project Statistics and Optimization Based Methods for Identification of Cancer-Activated Biological Processes (P2017-2519) supported by the Asia Research Center, Mongolia and Korea Foundation for Advanced Studies, Korea.

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## References

Duong (2017) <doi:10.18637/jss.v021.i07>, Christian P. Robert and George Casella (2010 ISBN:978-1-4419-1575-7) <doi:10.1007/978-1-4419-1576-4>.

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simulate\_kde

*Simulation with Kernel Density Estimation*

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## Description

Generates random values from a univariate and multivariate continuous distribution by using kernel density estimation based on a sample. The function uses the Accept-Reject method.

## Usage

```
simulate_kde(
  x,
  n = 100,
  distr = "norm",
  const.only = FALSE,
  seed = NULL,
  parallel = FALSE,
  ...
)
```

## Arguments

<code>x</code>	a numeric vector, matrix or data frame; data.
<code>n</code>	integer; the number of random values will be generated.
<code>distr</code>	character; instrumental or candidate distribution name. See details.
<code>const.only</code>	logical; if TRUE, the constant of the Accept-Reject method will be returned.
<code>seed</code>	a single value, interpreted as an integer, or NULL (default).
<code>parallel</code>	logical; if TRUE parallel generator will be worked. FALSE is default.
<code>...</code>	other parameters for functions <a href="#">kde</a> .

## Details

Such function uses the function [kde](#) as kernel density estimator.

The Accept-Reject method is used to simulate random variables. Following code named distributions can be used as a value of the argument `distr` and an instrumental or candidate distribution of the simulation method. For univariate distributions:

**norm** normal distribution (default),  $(-\infty, +\infty)$

**cauchy** Cauchy distribution,  $(-\infty, +\infty)$

**lnorm** log-normal distribution,  $(0, +\infty)$

**exp** exponential distribution,  $(0, +\infty)$

**gamma** gamma distribution,  $(0, +\infty)$

**weibull** Weibull distribution,  $(0, +\infty)$

**unif** uniform distribution,  $(a, b)$

And you can choose the best fitting instrumental distribution to simulate random variables more effectively by using `find_best_fit`. See examples.

For multivariate distributions, "norm" (multivariate normal distribution) is used.

### Value

list of given data, simulated values, kernel density estimation and the constant of the Accept-Reject method when `const.only` is FALSE (default).

### References

- Tarn Duong (2018). `ks`: Kernel Smoothing. R package version 1.11.2. <https://CRAN.R-project.org/package=ks>
- Christian P. Robert and George Casella (2010) *Introducing Monte Carlo Methods with R*. Springer. Pages 51-57.

### See Also

[find\\_best\\_fit](#), [kde](#)

### Examples

```
## 1-dimensional data
data(faithful)
hist(faithful$eruptions)
res <- simukde::simulate_kde(x = faithful$eruptions, n = 100, parallel = FALSE)
hist(res$random.values)

## Simulation with the best fitting instrumental distribution
data(faithful)
par(mfrow = c(1, 3))
hist(faithful$eruptions)
fit <- simukde::find_best_fit(x = faithful$eruptions, positive = TRUE)
res <- simukde::simulate_kde(
  x = faithful$eruptions, n = 100,
  distr = fit$distribution, parallel = FALSE
)
hist(res$random.values)
par(mfrow = c(1, 1))

## 2-dimensional data
data(faithful)
res <- simukde::simulate_kde(x = faithful, n = 100)
plot(res$kde, display = "filled.contour")
points(x = res$random.values, cex = 0.25, pch = 16, col = "green")
```

```
points(x = faithful, cex = 0.25, pch = 16, col = "black")
```

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