

Package ‘RandomWalker’

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Title Generate Random Walks Compatible with the 'tidyverse'

Version 1.1.0

Description Generates random walks of various types by providing a set of functions that are compatible with the 'tidyverse'. The functions provided in the package make it simple to create random walks with a variety of properties, such as how many simulations to run, how many steps to take, and the distribution of random walk itself.

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Encoding UTF-8

URL <https://www.spsanderson.com/RandomWalker/>,
<https://github.com/spsanderson/RandomWalker>

BugReports <https://github.com/spsanderson/RandomWalker/issues>

Language en

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animate_double_pendulum

Animate a Double Pendulum

Description

Animate a Double Pendulum

Usage

```
animate_double_pendulum(.data, .walk = 1, .trail_length = 30)
```

Arguments

<code>.data</code>	Data returned by <code>double_pendulum_walk()</code> .
<code>.walk</code>	One <code>walk_number</code> label to display, rather than its position.
<code>.trail_length</code>	Nonnegative integer number of recent sampled positions in the second bob's trail, including the current position. Zero disables it.

Details

Requires optional packages `ggplot2` and `gganimate`. GIF rendering additionally requires `gifski`. Each observation is one discrete frame; rendering at `fps = 1 / .delta_time` preserves simulated time.

Value

A `gganim` object. Construction does not render or save files.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Visualization Functions: [plot_double_pendulum\(\)](#), [visualize_walks\(\)](#)

Examples

```
## Not run:
walks <- double_pendulum_walk(.num_walks = 1, .n = 200)
animation <- animate_double_pendulum(walks)
gif <- gganimate::animate(animation, nframes = attr(walks, "n"),
  fps = 1 / attr(walks, "delta_time"), renderer = gganimate::gifsqi_renderer())
gganimate::anim_save("double-pendulum.gif", animation = gif)

## End(Not run)
```

brownian_motion

*Brownian Motion***Description**

Create a Brownian Motion Tibble

Usage

```
brownian_motion(
  .num_walks = 25,
  .n = 100,
  .delta_time = 1,
  .initial_value = 0,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	Total number of simulations.
<code>.n</code>	Total time of the simulation.
<code>.delta_time</code>	Time step size.
<code>.initial_value</code>	Integer representing the initial value.
<code>.dimensions</code>	The default is 1. Allowable values are 1, 2 and 3.

Details

Brownian Motion, also known as the Wiener process, is a continuous-time random process that describes the random movement of particles suspended in a fluid. It is named after the physicist Robert Brown, who first described the phenomenon in 1827.

The equation for Brownian Motion can be represented as:

$$W(t) = W(0) + \sqrt{t} * Z$$

Where $W(t)$ is the Brownian motion at time t , $W(0)$ is the initial value of the Brownian motion, $\sqrt{t}$ is the square root of time, and Z is a standard normal random variable.

Brownian Motion has numerous applications, including modeling stock prices in financial markets, modeling particle movement in fluids, and modeling random walk processes in general. It is a useful tool in probability theory and statistical analysis.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion_walk()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
brownian_motion()

set.seed(123)
brownian_motion(.dimensions = 3) |>
  head() |>
  t()
```

cgmean

Cumulative Geometric Mean

Description

A function to return the cumulative geometric mean of a vector.

Usage

```
cgmean(.x)
```

Arguments

`.x` A numeric vector

Details

A function to return the cumulative geometric mean of a vector. `exp(cummean(log(.x)))`

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg

cgmean(x)
```

chmean*Cumulative Harmonic Mean*

Description

A function to return the cumulative harmonic mean of a vector.

Usage

```
chmean(.x)
```

Arguments

`.x` A numeric vector

Details

A function to return the cumulative harmonic mean of a vector. $1 / (\text{cumsum}(1 / .x))$

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
chmean(x)
```

`ckurtosis`*Cumulative Kurtosis*

Description

A function to return the cumulative kurtosis of a vector.

Usage

```
ckurtosis(.x)
```

Arguments

`.x` A numeric vector

Details

A function to return the cumulative kurtosis of a vector.

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
ckurtosis(x)
```

cmean	<i>Cumulative Mean</i>
-------	------------------------

Description

A function to return the cumulative mean of a vector.

Usage

```
cmean(.x)
```

Arguments

.x A numeric vector

Details

A function to return the cumulative mean of a vector. It uses `dplyr::cummean()` as the basis of the function.

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: `cgmean()`, `chmean()`, `ckurtosis()`, `cmedian()`, `crange()`, `csd()`, `cskewness()`, `cvar()`, `euclidean_distance()`, `kurtosis_vec()`, `rw_range()`, `skewness_vec()`

Examples

```
x <- mtcars$mpg  
  
cmean(x)
```

cmedian

Cumulative Median

Description

A function to return the cumulative median of a vector.

Usage

```
cmedian(.x)
```

Arguments

.x A numeric vector

Details

A function to return the cumulative median of a vector.

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
cmedian(x)
```

confidence_interval	<i>Confidence Interval</i>
---------------------	----------------------------

Description

Calculate the confidence interval

Usage

```
confidence_interval(.vector, .interval = 0.95)
```

Arguments

.vector	A numeric vector of data points
.interval	A numeric value representing the confidence level (e.g., 0.95 for 95% confidence interval) The default is 0.95

Details

This function calculates the confidence interval for a given vector and interval.

Value

A named vector with the lower and upper bounds of the confidence interval

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
confidence_interval(rnorm(100), 0.95)
```

`convert_snake_to_title_case`*Helper function to convert a snake_case string to Title Case*

Description

Converts a snake_case string to Title Case.

Usage

```
convert_snake_to_title_case(string)
```

Arguments

`string` A character string in snake_case format.

Details

This function is useful for formatting strings in a more readable way, especially when dealing with variable names or identifiers that use snake_case. This function takes a snake_case string and converts it to Title Case. It replaces underscores with spaces, capitalizes the first letter of each word, and replaces the substring "cum" with "cumulative" for better readability.

Value

A character string converted to Title Case.

Author(s)

Antti Lennart Rask

See Also

Other Utility Functions: `confidence_interval()`, `generate_caption()`, `get_attributes()`, `rand_walk_column_names()`, `rand_walk_helper()`, `running_quantile()`, `std_cum_max_augment()`, `std_cum_mean_augment()`, `std_cum_min_augment()`, `std_cum_prod_augment()`, `std_cum_sum_augment()`, `subset_walks()`

Examples

```
convert_snake_to_title_case("hello_world") # "Hello World"
convert_snake_to_title_case("this_is_a_test") # "This Is A Test"
convert_snake_to_title_case("cumulative_sum") # "Cumulative Sum"
```

crange	<i>Cumulative Range</i>
--------	-------------------------

Description

A function to return the cumulative range of a vector.

Usage

```
crange(.x)
```

Arguments

.x A numeric vector

Details

A function to return the cumulative range of a vector. It uses $\max(.x[1:k]) - \min(.x[1:k])$ as the basis of the function.

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
crange(x)
```

`csd`*Cumulative Standard Deviation*

Description

A function to return the cumulative standard deviation of a vector.

Usage

```
csd(.x)
```

Arguments

`.x` A numeric vector

Details

A function to return the cumulative standard deviation of a vector.

Value

A numeric vector. Note: The first entry will always be NaN.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
csd(x)
```

cskewness	<i>Cumulative Skewness</i>
-----------	----------------------------

Description

A function to return the cumulative skewness of a vector.

Usage

```
cskewness(.x)
```

Arguments

.x A numeric vector

Details

A function to return the cumulative skewness of a vector.

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
cskewness(x)
```

 custom_walk

Generate Multiple Custom Random Walks in Multiple Dimensions

Description

The custom_walk function generates multiple random walks in 1, 2, or 3 dimensions using a user-provided custom function. Each walk is a sequence of steps where each step is generated by calling the provided custom function. This allows users to create random walks with any type of step distribution.

Usage

```
custom_walk(
  .n = 100,
  .num_walks = 25,
  .initial_value = 0,
  .dimensions = 1,
  .custom_fns
)
```

Arguments

.n	An integer specifying the number of steps in each walk. Default is 100.
.num_walks	An integer specifying the number of random walks to generate. Default is 25.
.initial_value	A numeric value indicating the initial value of the walks. Default is 0.
.dimensions	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.
.custom_fns	A function that generates a single random step. The function should take no parameters and return a single numeric value. This function will be called repeatedly to generate steps for the random walks.

Details

This function provides a flexible way to generate random walks using any custom random number generation function. The custom function should take no parameters and return a single numeric value representing the step displacement. The function will be called repeatedly to generate the required number of steps for each walk and dimension.

The resulting data structure follows the same pattern as other walk generation functions in this package, including cumulative statistics and proper attribute setting for further analysis and visualization.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- walk_number: Factor representing the walk number.

- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: [brownian_motion\(\)](#), [discrete_walk\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_binomial_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_poisson_walk\(\)](#), [random_smirnov_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Examples

```
# Biased random walk with upward trend
biased_displacement <- function() {
  return(rnorm(1, mean = 0.1, sd = 1.0))
}

set.seed(123)
custom_walk(.n = 100, .num_walks = 5, .custom_fns = biased_displacement)

# Multi-dimensional custom walk
set.seed(123)
custom_walk(.n = 50, .num_walks = 3, .dimensions = 2, .custom_fns = biased_displacement)
```

`cvar`*Cumulative Variance*

Description

A function to return the cumulative variance of a vector.

Usage

```
cvar(.x)
```

Arguments

`.x` A numeric vector

Details

A function to return the cumulative variance of a vector. `exp(cummean(log(.x)))`

Value

A numeric vector. Note: The first entry will always be NaN.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg  
  
cvar(x)
```

discrete_walk	<i>Discrete Sampled Walk</i>
---------------	------------------------------

Description

The `discrete_walk` function generates multiple random walks over discrete time periods. Each step in the walk is determined by a probabilistic sample from specified upper and lower bounds. This function is useful for simulating stochastic processes, such as stock price movements or other scenarios where outcomes are determined by a random process.

Usage

```
discrete_walk(
  .num_walks = 25,
  .n = 100,
  .upper_bound = 1,
  .lower_bound = -1,
  .upper_probability = 0.5,
  .initial_value = 100,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	Total number of simulations.
<code>.n</code>	Total time of the simulation.
<code>.upper_bound</code>	The upper bound of the random walk.
<code>.lower_bound</code>	The lower bound of the random walk.
<code>.upper_probability</code>	The probability of the upper bound. Default is 0.5. The lower bound is calculated as $1 - .upper_probability$.
<code>.initial_value</code>	The initial value of the random walk. Default is 100.
<code>.dimensions</code>	The default is 1. Allowable values are 1, 2 and 3.

Details

The function `discrete_walk` simulates random walks for a specified number of simulations (`.num_walks`) over a given total time (`.n`). Each step in the walk is either the upper bound or the lower bound, determined by a probability (`.upper_probability`). The initial value of the walk is set by the user (`.initial_value`), and the cumulative sum, product, minimum, and maximum of the steps are calculated for each walk. The results are returned in a tibble with detailed attributes, including the parameters used for the simulation.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- walk_number: Factor representing the walk number.
- step_number: Step index.
- y: If .dimensions = 1, the value of the walk at each step.
- x, y: If .dimensions = 2, the values of the walk in two dimensions.
- x, y, z: If .dimensions = 3, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- cum_sum: Cumulative sum of dplyr::all_of(.dimensions).
- cum_prod: Cumulative product of dplyr::all_of(.dimensions).
- cum_min: Cumulative minimum of dplyr::all_of(.dimensions).
- cum_max: Cumulative maximum of dplyr::all_of(.dimensions).
- cum_mean: Cumulative mean of dplyr::all_of(.dimensions).

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: [brownian_motion\(\)](#), [custom_walk\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_binomial_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_poisson_walk\(\)](#), [random_smirnov_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Other Discrete Distribution: [random_binomial_walk\(\)](#), [random_displacement_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_poisson_walk\(\)](#), [random_smirnov_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Examples

```
set.seed(123)
discrete_walk()

set.seed(123)
discrete_walk(.dimensions = 3) |>
  head() |>
  t()
```

double_pendulum_walk *Double Pendulum Walk*

Description

Simulate a planar frictionless double pendulum with massless rigid rods and point masses. Randomness enters only through starting angles; subsequent continuous-time motion is deterministic.

Usage

```
double_pendulum_walk(
  .num_walks = 5,
  .n = 401,
  .delta_time = 0.05,
  .theta1 = pi/2,
  .theta2 = pi/2,
  .omega1 = 0,
  .omega2 = 0,
  .angle_sd = 0.01,
  .m1 = 1,
  .m2 = 1,
  .l1 = 1,
  .l2 = 1,
  .gravity = 9.81
)
```

Arguments

<code>.num_walks</code>	Positive integer number of trajectories.
<code>.n</code>	Integer number of observations, including time zero (at least two).
<code>.delta_time</code>	Positive sampling interval in seconds, not the solver step.
<code>.theta1, .theta2</code>	Initial angles in radians from vertically downward.
<code>.omega1, .omega2</code>	Initial angular velocities in radians per second.
<code>.angle_sd</code>	Nonnegative standard deviation of independent normal angle perturbations. Zero consumes no random numbers. Use <code>set.seed()</code> for repeatability.
<code>.m1, .m2</code>	Positive bob masses in kilograms.
<code>.l1, .l2</code>	Positive rod lengths in meters.
<code>.gravity</code>	Positive gravitational acceleration in meters per second squared.

Details

Uses optional package deSolve and adaptive LSODA integration with relative and absolute tolerances of $1e-9$. Times are $(0:(.n - 1)) * .delta_time$. The default covers 20 seconds. Angles are absolute, not relative to the other rod; positive angles move toward positive x from downward vertical. The pivot is at the origin and y increases upward. This is an ensemble of randomized initial conditions, not a process with random forces or random waiting times.

Value

An ungrouped tibble with factor walk_number, integer step_number, time, angles theta1, theta2, angular velocities omega1, omega2, first bob coordinates x1, y1, and second bob coordinates x, y. Coordinates are positions, not increments; no cumulative columns are added. Attributes contain parameters, initial_states, fns, n, num_steps, num_walks, delta_time, and dimensions = 2.

Author(s)

Steven P. Sanderson II, MPH

References

Equations: <https://www.myphysicslab.com/pendulum/double-pendulum-en.html>.

See Also

Other Generator Functions: [brownian_motion\(\)](#), [custom_walk\(\)](#), [discrete_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_binomial_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_poisson_walk\(\)](#), [random_smirnov_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Other Continuous Distribution: [brownian_motion\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#)

Examples

```
if (requireNamespace("deSolve", quietly = TRUE)) {
  set.seed(287)
  walks <- double_pendulum_walk(.num_walks = 2, .n = 21)
  head(walks)
}
```

euclidean_distance	<i>Distance Calculations</i>
--------------------	------------------------------

Description

A function to calculate the Euclidean distance between two vectors.

Usage

```
euclidean_distance(.data, .x, .y, .pull_vector = FALSE)
```

Arguments

<code>.data</code>	A data frame
<code>.x</code>	A numeric vector
<code>.y</code>	A numeric vector
<code>.pull_vector</code>	A boolean of TRUE or FALSE. Default is FALSE which will augment the distance to the data frame. TRUE will return a vector of the distances as the return.

Details

A function to calculate the Euclidean distance between two vectors. It uses the formula $\sqrt{(x - \text{lag}(x))^2 + (y - \text{lag}(y))^2}$. The function uses augments the data frame with a new column called distance.

Value

A numeric Vector of ditances

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [kurtosis_vec\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
set.seed(123)
df <- rw30()
euclidean_distance(df, step_number, y)
euclidean_distance(df, step_number, y, TRUE) |> head(10)
```

generate_caption	<i>Helper function to generate a caption string based on provided attributes</i>
------------------	--

Description

Generates a caption string based on provided attributes.

Usage

```
generate_caption(attributes)
```

Arguments

attributes	A list containing various attributes that may include dimension, num_steps, mu, and sd.
------------	---

Details

This function is useful for creating descriptive captions for plots or outputs based on the attributes provided. It ensures that only non-null attributes are included in the caption. This function constructs a caption string by checking various attributes provided in a list. It formats the caption based on the presence of specific attributes, such as dimensions, number of steps, and statistical parameters like mu and standard deviation (sd).

Value

A character string representing the generated caption. If no attributes are provided, it returns an empty string.

Author(s)

Antti Lennart Rask

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
attrs <- list(dimension = 3, num_steps = 100, mu = 0.5, sd = 1.2)
generate_caption(attrs) # "3 dimensions, 100 steps, mu = 0.5, sd = 1.2."

attrs <- list(dimension = NULL, num_steps = 50, mu = NULL, sd = 2.0)
generate_caption(attrs) # "50 steps, sd = 2.0."
```

`geometric_brownian_motion`*Geometric Brownian Motion*

Description

Create a Geometric Brownian Motion.

Usage

```
geometric_brownian_motion(  
    .num_walks = 25,  
    .n = 100,  
    .mu = 0,  
    .sigma = 0.1,  
    .initial_value = 100,  
    .delta_time = 0.003,  
    .dimensions = 1  
)
```

Arguments

<code>.num_walks</code>	Total number of simulations.
<code>.n</code>	Total time of the simulation, how many n points in time.
<code>.mu</code>	Expected return
<code>.sigma</code>	Volatility
<code>.initial_value</code>	Integer representing the initial value.
<code>.delta_time</code>	Time step size.
<code>.dimensions</code>	The default is 1. Allowable values are 1, 2 and 3.

Details

Geometric Brownian Motion (GBM) is a statistical method for modeling the evolution of a given financial asset over time. It is a type of stochastic process, which means that it is a system that undergoes random changes over time.

GBM is widely used in the field of finance to model the behavior of stock prices, foreign exchange rates, and other financial assets. It is based on the assumption that the asset's price follows a random walk, meaning that it is influenced by a number of unpredictable factors such as market trends, news events, and investor sentiment.

The equation for GBM is:

$$dS/S = \mu dt + \sigma dW$$

where S is the price of the asset, t is time, m is the expected return on the asset, s is the volatility of the asset, and dW is a small random change in the asset's price.

GBM can be used to estimate the likelihood of different outcomes for a given asset, and it is often used in conjunction with other statistical methods to make more accurate predictions about the future performance of an asset.

This function provides the ability of simulating and estimating the parameters of a GBM process. It can be used to analyze the behavior of financial assets and to make informed investment decisions.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
geometric_brownian_motion()

set.seed(123)
geometric_brownian_motion(.dimensions = 3) |>
  head() |>
  t()
```

get_attributes	<i>Get Attributes</i>
----------------	-----------------------

Description

The `get_attributes` function takes an R object as input and returns its attributes, omitting the `row.names` attribute.

Usage

```
get_attributes(.data)
```

Arguments

<code>.data</code>	An R object from which attributes are to be extracted.
--------------------	--

Details

This function retrieves the attributes of a given R object, excluding the `row.names` attribute.

Value

A list of attributes of the input R object, excluding `row.names`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
get_attributes(rw30())
get_attributes(iris)
get_attributes(mtcars)
```

kurtosis_vec

Compute Kurtosis of a Vector

Description

This function takes in a vector as it's input and will return the kurtosis of that vector. The length of this vector must be at least four numbers. The kurtosis explains the sharpness of the peak of a distribution of data.

$$\frac{\frac{1}{n} \sum (x - \mu)^4}{\left(\frac{1}{n} \sum (x - \mu)^2\right)^2}$$

Usage

```
kurtosis_vec(.x)
```

Arguments

`.x` A numeric vector of length four or more.

Details

A function to return the kurtosis of a vector.

Value

The kurtosis of a vector

Author(s)

Steven P. Sanderson II, MPH

See Also

<https://en.wikipedia.org/wiki/Kurtosis>

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [rw_range\(\)](#), [skewness_vec\(\)](#)

Examples

```
set.seed(123)
kurtosis_vec(rnorm(100, 3, 2))
```

plot_double_pendulum *Plot a Double Pendulum Trajectory*

Description

Plot a Double Pendulum Trajectory

Usage

```
plot_double_pendulum(.data, .walk = 1)
```

Arguments

.data	Data returned by double_pendulum_walk() .
.walk	One walk_number label to display, rather than its position.

Value

A customizable ggplot of the second bob's spatial trajectory, colored by elapsed seconds. Coordinates are in meters.

a ggplot2 object.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Visualization Functions: [animate_double_pendulum\(\)](#), [visualize_walks\(\)](#)

Examples

```
if (requireNamespace("deSolve", quietly = TRUE)) {  
  plot_double_pendulum(double_pendulum_walk(.num_walks = 1, .n = 200))  
}
```

random_beta_walk

Generate Multiple Random Beta Walks in Multiple Dimensions

Description

The random_beta_walk function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a Beta distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the Beta distribution (shape1, shape2, ncp). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_beta_walk(
  .num_walks = 25,
  .n = 100,
  .shape1 = 2,
  .shape2 = 2,
  .ncp = 0,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

.num_walks	An integer specifying the number of random walks to generate. Default is 25.
.n	An integer specifying the number of steps in each walk. Must be ≥ 1 . Default is 100.
.shape1	Non-negative parameter of the Beta distribution. Default is 2.
.shape2	Non-negative parameter of the Beta distribution. Default is 2.
.ncp	Non-centrality parameter ($\text{ncp} \geq 0$). Default is 0.
.initial_value	A numeric value indicating the initial value of the walks. Default is 0.
.samp	A logical value indicating whether to sample the Beta distribution values. Default is TRUE.
.replace	A logical value indicating whether sampling is with replacement. Default is TRUE.
.sample_size	A numeric value between 0 and 1 specifying the proportion of .n to sample. Default is 0.8.
.dimensions	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

The shape1, shape2, and ncp parameters can be single values or vectors of length equal to the number of dimensions. If vectors are provided, each dimension uses its corresponding value.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- walk_number: Factor representing the walk number.
- step_number: Step index.
- y: If .dimensions = 1, the value of the walk at each step.
- x, y: If .dimensions = 2, the values of the walk in two dimensions.
- x, y, z: If .dimensions = 3, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- cum_sum: Cumulative sum of dplyr::all_of(.dimensions).
- cum_prod: Cumulative product of dplyr::all_of(.dimensions).
- cum_min: Cumulative minimum of dplyr::all_of(.dimensions).
- cum_max: Cumulative maximum of dplyr::all_of(.dimensions).
- cum_mean: Cumulative mean of dplyr::all_of(.dimensions).

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: [brownian_motion\(\)](#), [custom_walk\(\)](#), [discrete_walk\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_binomial_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_poisson_walk\(\)](#), [random_smirnov_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Other Continuous Distribution: [brownian_motion\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#)

Examples

```

set.seed(123)
random_beta_walk()

set.seed(123)
random_beta_walk(.dimensions = 3, .shape1 = c(2, 3, 4), .shape2 = c(2, 3, 4), .ncp = c(0, 1, 2)) |>
  head() |>
  t()

```

random_binomial_walk *Generate Multiple Random Binomial Walks in Multiple Dimensions*

Description

The `random_binomial_walk` function generates multiple random walks using the binomial distribution via `rbinom()`. The user can specify the number of walks, the number of steps in each walk, the number of trials, and the probability of success. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```

random_binomial_walk(
  .num_walks = 25,
  .n = 100,
  .size = 10,
  .prob = 0.5,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)

```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of observations per walk. Must be greater than 0. Default is 100.
<code>.size</code>	An integer specifying the number of trials (zero or more). Default is 10.
<code>.prob</code>	A numeric value specifying the probability of success on each trial. Must be $0 \leq \text{.prob} \leq 1$. Default is 0.5.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the binomial values. Default is TRUE.

<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function generates random walks where each step is drawn from the binomial distribution using `rbinom()`. The user can control the number of walks, steps per walk, the number of trials (`size`), and the probability of success (`prob`). The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: [brownian_motion\(\)](#), [custom_walk\(\)](#), [discrete_walk\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#),

```
random_normal_walk(), random_poisson_walk(), random_smirnov_walk(), random_t_walk(),
random_uniform_walk(), random_weibull_walk(), random_wilcox_walk(), random_wilcoxon_sr_walk()
```

Other Discrete Distribution: `discrete_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
set.seed(123)
random_binomial_walk()

set.seed(123)
random_binomial_walk(.dimensions = 2) |>
  head() |>
  t()
```

random_cauchy_walk	<i>Generate Multiple Random Cauchy Walks in Multiple Dimensions</i>
--------------------	---

Description

The `random_cauchy_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a Cauchy distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the Cauchy distribution (location and scale). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_cauchy_walk(
  .num_walks = 25,
  .n = 100,
  .location = 0,
  .scale = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.

<code>.location</code>	A numeric value indicating the location parameter of the Cauchy distribution. Default is 0.
<code>.scale</code>	A numeric value indicating the scale parameter of the Cauchy distribution. Default is 1.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the Cauchy distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

The location and scale parameters can be single values or vectors of length equal to the number of dimensions. If vectors are provided, each dimension uses its corresponding value.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_cauchy_walk()

set.seed(123)
random_cauchy_walk(.dimensions = 3, .location = c(0, 1, 2), .scale = c(1, 2, 3)) |>
  head() |>
  t()
```

random_chisquared_walk

Generate Multiple Random Chi-Squared Walks in Multiple Dimensions

Description

The `random_chisquared_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a chi-squared distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the chi-squared distribution (`df` and `ncp`). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_chisquared_walk(
  .num_walks = 25,
  .n = 100,
  .df = 5,
  .ncp = 0,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
```

```

    .sample_size = 0.8,
    .dimensions = 1
  )

```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.df</code>	Degrees of freedom for the chi-squared distribution. Default is 5.
<code>.ncp</code>	Non-centrality parameter (non-negative). Default is 0.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the chi-squared distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from a chi-squared distribution. The user can control the number of walks, steps per walk, degrees of freedom (`df`), and the non-centrality parameter (`ncp`). The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_chisquared_walk()

set.seed(123)
random_chisquared_walk(.dimensions = 3) |>
  head() |>
  t()
```

```
random_displacement_walk
```

Generate a Random Displacement Walk in 2D

Description

The `random_displacement_walk` function generates a single random walk in 2 dimensions (x, y), where each step is a random displacement in both x and y directions, sampled from the provided displacement and distance spaces. The walk disregards steps where both x and y displacements are zero.

Usage

```
random_displacement_walk(
  .num_walks = 25,
  .seed = NULL,
  .n = 100,
  .distance_space = c(0, 1, 2, 3, 4),
  .displacement = c(-1, 1),
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.seed</code>	An optional value to set the random seed. If NULL, no seed is set. Default is NULL.
<code>.n</code>	The number of steps in the walk. Must be ≥ 0 . Default is 100.
<code>.distance_space</code>	A numeric vector of possible step distances. Default is <code>c(0, 1, 2, 3, 4)</code> .
<code>.displacement</code>	A numeric vector of possible step directions. Default is <code>c(-1, 1)</code> .
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Value

A tibble with columns depending on the number of dimensions:

- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
random_displacement_walk(.n = 10, .seed = Sys.Date())
```

random_exponential_walk

Generate Multiple Random Exponential Walks in Multiple Dimensions

Description

The random_exponential_walk function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from an exponential distribution.

Usage

```
random_exponential_walk(
  .num_walks = 25,
  .n = 100,
  .rate = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

.num_walks	An integer specifying the number of random walks to generate. Default is 25.
.n	An integer specifying the number of steps in each walk. Must be ≥ 1 . Default is 100.
.rate	A numeric value or vector indicating the rate parameter(s) of the exponential distribution. Default is 1.
.initial_value	A numeric value indicating the initial value of the walks. Default is 0.
.samp	A logical value indicating whether to sample the exponential distribution values. Default is TRUE.
.replace	A logical value indicating whether sampling is with replacement. Default is TRUE.
.sample_size	A numeric value between 0 and 1 specifying the proportion of .n to sample. Default is 0.8.
.dimensions	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

The rate parameter can be a single value or a vector of length equal to the number of dimensions. If a vector is provided, each dimension uses its corresponding rate.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- walk_number: Factor representing the walk number.
- step_number: Step index.
- y: If .dimensions = 1, the value of the walk at each step.
- x, y: If .dimensions = 2, the values of the walk in two dimensions.
- x, y, z: If .dimensions = 3, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- cum_sum: Cumulative sum of dplyr::all_of(.dimensions).
- cum_prod: Cumulative product of dplyr::all_of(.dimensions).
- cum_min: Cumulative minimum of dplyr::all_of(.dimensions).
- cum_max: Cumulative maximum of dplyr::all_of(.dimensions).
- cum_mean: Cumulative mean of dplyr::all_of(.dimensions).

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: [brownian_motion\(\)](#), [custom_walk\(\)](#), [discrete_walk\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_binomial_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_poisson_walk\(\)](#), [random_smirnov_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Other Continuous Distribution: [brownian_motion\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#)

Examples

```
set.seed(123)
random_exponential_walk()
```

```
set.seed(123)
random_exponential_walk(.dimensions = 3, .rate = c(0.1, 0.1, 0.2)) |>
  head() |>
  t()
```

random_f_walk

*Generate Multiple Random F Walks in Multiple Dimensions***Description**

The `random_f_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from an F distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the F distribution (`df1`, `df2`, `ncp`). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_f_walk(
  .num_walks = 25,
  .n = 100,
  .df1 = 5,
  .df2 = 5,
  .ncp = NULL,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.df1</code>	Degrees of freedom 1 for the F distribution. Default is 5.
<code>.df2</code>	Degrees of freedom 2 for the F distribution. Default is 5.
<code>.ncp</code>	Non-centrality parameter. Default is NULL (central F).
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the F distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from an F distribution. The user can control the number of walks, steps per walk, degrees of freedom (df1, df2), and optionally the non-centrality parameter (ncp). If .ncp is left as NULL, the function generates F values using the ratio of chi-squared distributions as described in base R documentation. The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- walk_number: Factor representing the walk number.
- step_number: Step index.
- y: If .dimensions = 1, the value of the walk at each step.
- x, y: If .dimensions = 2, the values of the walk in two dimensions.
- x, y, z: If .dimensions = 3, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- cum_sum: Cumulative sum of `dplyr::all_of(.dimensions)`.
- cum_prod: Cumulative product of `dplyr::all_of(.dimensions)`.
- cum_min: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- cum_max: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- cum_mean: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_f_walk()

set.seed(123)
random_f_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_gamma_walk	<i>Generate Multiple Random Gamma Walks in Multiple Dimensions</i>
-------------------	--

Description

The `random_gamma_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a gamma distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the gamma distribution (shape, scale, rate). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_gamma_walk(
  .num_walks = 25,
  .n = 100,
  .shape = 1,
  .scale = 1,
  .rate = NULL,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Must be greater than 0. Default is 100.
<code>.shape</code>	A positive numeric value for the shape parameter. Default is 1.
<code>.scale</code>	A positive numeric value for the scale parameter. Default is 1.
<code>.rate</code>	A positive numeric value for the rate parameter. Default is NULL (ignored if scale is provided).
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.

<code>.samp</code>	A logical value indicating whether to sample the gamma distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from a gamma distribution. The user can control the number of walks, steps per walk, and the shape, scale, and rate parameters for the distribution. The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_gamma_walk()

set.seed(123)
random_gamma_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_geometric_walk *Generate Multiple Random Geometric Walks in Multiple Dimensions*

Description

The `random_geometric_walk` function generates multiple random walks using the geometric distribution via `rgeom()`. The user can specify the number of walks, the number of steps in each walk, and the probability of success in each trial. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_geometric_walk(
  .num_walks = 25,
  .n = 100,
  .prob = 0.5,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of observations per walk. Default is 100.
<code>.prob</code>	A numeric value specifying the probability of success in each trial. Must be $0 < .prob \leq 1$. Default is 0.5.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the geometric values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function generates random walks where each step is drawn from the geometric distribution using `rgeom()`. The user can control the number of walks, steps per walk, and the probability of success (`prob`). The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
set.seed(123)
random_geometric_walk()

set.seed(123)
random_geometric_walk(.dimensions = 2) |>
  head() |>
  t()
```

random_hypergeometric_walk

Generate Multiple Random Hypergeometric Walks in Multiple Dimensions

Description

The `random_hypergeometric_walk` function generates multiple random walks using the hypergeometric distribution via `rhyper()`. The user can specify the number of walks, the number of steps in each walk, and the urn parameters (m , n , k). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_hypergeometric_walk(
  .num_walks = 25,
  .nn = 100,
  .m = 50,
  .n = 50,
  .k = 10,
```

```

    .initial_value = 0,
    .samp = TRUE,
    .replace = TRUE,
    .sample_size = 0.8,
    .dimensions = 1
  )

```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.nn</code>	An integer specifying the number of observations per walk. Default is 100.
<code>.m</code>	An integer specifying the number of white balls in the urn. Default is 50.
<code>.n</code>	An integer specifying the number of black balls in the urn. Default is 50.
<code>.k</code>	An integer specifying the number of balls drawn from the urn. Default is 10.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the hypergeometric values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.nn</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function generates random walks where each step is drawn from the hypergeometric distribution using `rhyper()`. The user can control the number of walks, steps per walk, and the urn parameters: `m` (white balls), `n` (black balls), and `k` (balls drawn). The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.

- cum_prod: Cumulative product of `dplyr::all_of(.dimensions)`.
- cum_min: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- cum_max: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- cum_mean: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
set.seed(123)
random_hypergeometric_walk()

set.seed(123)
random_hypergeometric_walk(.dimensions = 2) |>
  head() |>
  t()
```

random_logistic_walk *Generate Multiple Random Logistic Walks in Multiple Dimensions*

Description

The `random_logistic_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a logistic distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the logistic distribution (location and scale). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_logistic_walk(
  .num_walks = 25,
  .n = 100,
  .location = 0,
  .scale = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.location</code>	A numeric value indicating the location parameter of the logistic distribution. Default is 0.
<code>.scale</code>	A numeric value indicating the scale parameter of the logistic distribution. Default is 1.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the logistic distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from a logistic distribution. The user can control the number of walks, steps per walk, and the location and scale parameters for the distribution. The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.

- x, y: If `.dimensions = 2`, the values of the walk in two dimensions.
- x, y, z: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- cum_sum: Cumulative sum of `dplyr::all_of(.dimensions)`.
- cum_prod: Cumulative product of `dplyr::all_of(.dimensions)`.
- cum_min: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- cum_max: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- cum_mean: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_logistic_walk()

set.seed(123)
random_logistic_walk(.dimensions = 2) |>
  head() |>
  t()
```

random_lognormal_walk *Generate Multiple Random Lognormal Walks in Multiple Dimensions*

Description

The random_lognormal_walk function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a lognormal distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the lognormal distribution (meanlog and sdlog). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_lognormal_walk(
  .num_walks = 25,
  .n = 100,
  .meanlog = 0,
  .sdlog = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

.num_walks	An integer specifying the number of random walks to generate. Default is 25.
.n	An integer specifying the number of steps in each walk. Default is 100.
.meanlog	A numeric value indicating the meanlog parameter of the lognormal distribution. Default is 0.
.sdlog	A numeric value indicating the sdlog parameter of the lognormal distribution. Default is 1.
.initial_value	A numeric value indicating the initial value of the walks. Default is 0.
.samp	A logical value indicating whether to sample the lognormal distribution values. Default is TRUE.
.replace	A logical value indicating whether sampling is with replacement. Default is TRUE.
.sample_size	A numeric value between 0 and 1 specifying the proportion of .n to sample. Default is 0.8.
.dimensions	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from a lognormal distribution. The user can control the number of walks, steps per walk, and the meanlog and sdlog parameters for the distribution. The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_lognormal_walk()

set.seed(123)
random_lognormal_walk(.dimensions = 2) |>
  head() |>
  t()
```

random_multinomial_walk

Generate Multiple Random Multinomial Walks

Description

A multinomial random walk is a stochastic process in which each step is drawn from the multinomial distribution. This function allows for the simulation of multiple independent random walks in one, two, or three dimensions, with user control over the number of walks, steps, trials, probabilities, and dimensions. Sampling options allow for further customization, including the ability to sample a proportion of steps and to sample with or without replacement. The resulting data frame includes cumulative statistics for each walk.

Usage

```
random_multinomial_walk(
  .num_walks = 25,
  .n = 100,
  .size = 3,
  .prob = rep(1/3, .n),
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

.num_walks	Integer. Number of random walks to generate. Default is 25.
.n	Integer. Length of each walk (number of steps). Default is 100.
.size	Integer. Number of trials for each multinomial draw. Default is 3.
.prob	Numeric vector. Probabilities for each outcome. Default is rep(1/3, .n).
.initial_value	Numeric. Starting value of the walk. Default is 0.
.samp	Logical. Whether to sample the steps. Default is TRUE.

<code>.replace</code>	Logical. Whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	Numeric. Proportion of steps to sample (0-1). Default is 0.8.
<code>.dimensions</code>	Integer. Number of dimensions (1, 2, or 3). Default is 1.

Details

The `random_multinomial_walk` function generates multiple random walks using the multinomial distribution via `stats::rmultinom()`. Each walk is a sequence of steps where each step is a random draw from the multinomial distribution. The user can specify the number of walks, steps, trials per step, and the probability vector. Sampling options allow for further customization, including the ability to sample a proportion of steps and to sample with or without replacement. The resulting data frame includes cumulative statistics for each walk, making it suitable for simulation studies and visualization.

Value

A tibble containing the generated random walks with columns:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `value`: Value of the walk at each step.
- Cumulative statistics: `cum_sum`, `cum_prod`, `cum_min`, `cum_max`, `cum_mean`.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
set.seed(123)
random_multinomial_walk()

set.seed(123)
random_multinomial_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_negbinomial_walk

Generate Multiple Random Negative Binomial Walks

Description

A Negative Binomial random walk is a stochastic process in which each step is drawn from the Negative Binomial distribution, commonly used for modeling count data with overdispersion. This function allows for the simulation of multiple independent random walks in one, two, or three dimensions, with user control over the number of walks, steps, and the distribution parameters. Sampling options allow for further customization, including the ability to sample a proportion of steps and to sample with or without replacement. The resulting data frame includes cumulative statistics for each walk, making it suitable for simulation studies and visualization.

Usage

```
random_negbinomial_walk(
  .num_walks = 25,
  .n = 100,
  .size = 1,
  .prob = 0.5,
  .mu = NULL,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	Integer. Number of random variables to return for each walk. Default is 100.
<code>.size</code>	Integer. Number of successful trials or dispersion parameter. Default is 1. This must also match the number of dimensions, for example if <code>.dimensions = 3</code> , then <code>.size</code> must be a vector of length 3 like <code>c(1, 2, 3)</code> .

<code>.prob</code>	Numeric. Probability of success in each trial ($0 < \text{prob} \leq 1$). Default is 0.5. This must also match the number of dimensions, for example if <code>.dimensions = 3</code> , then <code>.prob</code> must be a vector of length 3 like <code>c(0.5, 0.7, 0.9)</code> .
<code>.mu</code>	Numeric. Alternative parametrization via mean. Default is NULL. This must also match the number of dimensions, for example if <code>.dimensions = 3</code> , then <code>.mu</code> must be a vector of length 3 like <code>c(1, 2, 3)</code> .
<code>.initial_value</code>	Numeric. Starting value of the walk. Default is 0.
<code>.samp</code>	Logical. Whether to sample the steps. Default is TRUE.
<code>.replace</code>	Logical. Whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	Numeric. Proportion of steps to sample (0-1). Default is 0.8.
<code>.dimensions</code>	Integer. Number of dimensions (1, 2, or 3). Default is 1.

Details

The `random_negbinomial_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from the Negative Binomial distribution using `stats::rnbinom()`. The user can specify the number of samples in each walk (`n`), the size parameter, the probability of success (`prob`), and/or the mean (`mu`), and the number of dimensions. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
set.seed(123)
random_negbinomial_walk()

set.seed(123)
random_negbinomial_walk(.dimensions = 3,
  .size = c(1,2,3),
  .prob = c(0.5,0.7,0.9)
) |>
head() |>
t()
```

random_normal_drift_walk

Generate Multiple Random Walks with Drift

Description

This function generates a specified number of random walks, each consisting of a specified number of steps. The steps are generated from a normal distribution with a given mean and standard deviation. An additional drift term is added to each step to introduce a consistent directional component to the walks.

Usage

```
random_normal_drift_walk(
  .num_walks = 25,
  .n = 100,
  .mu = 0,
  .sd = 1,
  .drift = 0.1,
  .initial_value = 0,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	Integer. The number of random walks to generate. Default is 25.
<code>.n</code>	Integer. The number of steps in each random walk. Default is 100.
<code>.mu</code>	Numeric. The mean of the normal distribution used for generating steps. Default is 0.
<code>.sd</code>	Numeric. The standard deviation of the normal distribution used for generating steps. Default is 1.
<code>.drift</code>	Numeric. The drift term to be added to each step. Default is 0.1.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.dimensions</code>	The default is 1. Allowable values are 1, 2 and 3.

Details

This function generates multiple random walks with a specified drift. Each walk is generated using a normal distribution for the steps, with an additional drift term added to each step.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_normal_drift_walk()

set.seed(123)
random_normal_drift_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_normal_walk	<i>Generate Multiple Random Normal Walks in Multiple Dimensions</i>
--------------------	---

Description

The `random_normal_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a normal distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the normal distribution (mean and standard deviation). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_normal_walk(
  .num_walks = 25,
  .n = 100,
  .mu = 0,
  .sd = 0.1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.mu</code>	A numeric value indicating the mean of the normal distribution. Default is 0.
<code>.sd</code>	A numeric value indicating the standard deviation of the normal distribution. Default is 0.1.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the normal distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_normal_walk()

set.seed(123)
random_normal_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_poisson_walk	<i>Generate Multiple Random Poisson Walks</i>
---------------------	---

Description

A Poisson random walk is a stochastic process in which each step is drawn from the Poisson distribution, commonly used for modeling count data. This function allows for the simulation of multiple independent random walks in one, two, or three dimensions, with user control over the number of walks, steps, and the lambda parameter for the distribution. Sampling options allow for further customization, including the ability to sample a proportion of steps and to sample with or without replacement. The resulting data frame includes cumulative statistics for each walk, making it suitable for simulation studies and visualization.

Usage

```
random_poisson_walk(
  .num_walks = 25,
  .n = 100,
  .lambda = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
```

```

    .dimensions = 1
  )

```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	Integer. Number of random variables to return for each walk. Default is 100.
<code>.lambda</code>	Numeric or vector. Mean(s) for the Poisson distribution. Default is 1.
<code>.initial_value</code>	Numeric. Starting value of the walk. Default is 0.
<code>.samp</code>	Logical. Whether to sample the steps. Default is TRUE.
<code>.replace</code>	Logical. Whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	Numeric. Proportion of steps to sample (0-1). Default is 0.8.
<code>.dimensions</code>	Integer. Number of dimensions (1, 2, or 3). Default is 1.

Details

The `random_poisson_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from the Poisson distribution using `base::rpois()`. The user can specify the number of samples in each walk (`n`), the `lambda` parameter for the Poisson distribution, and the number of dimensions. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Examples

```
set.seed(123)
random_poisson_walk()

set.seed(123)
random_poisson_walk(.dimensions = 3, .lambda = c(1, 2, 3)) |>
  head() |>
  t()
```

random_smirnov_walk	<i>Generate Multiple Random Smirnov Walks in Multiple Dimensions</i>
---------------------	--

Description

The `random_smirnov_walk` function generates multiple random walks using the Smirnov distribution via `rsmirnov()`. The user can specify the number of walks, the number of steps in each walk, the sizes parameter, and the alternative hypothesis. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_smirnov_walk(
  .num_walks = 25,
  .n = 100,
  .sizes = c(1, 1),
  .z = NULL,
  .alternative = "two.sided",
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.sizes</code>	A numeric vector of length 2 specifying the sizes parameter for <code>rsmirnov</code> . Default is <code>c(1, 1)</code> .
<code>.z</code>	Optional numeric vector for the <code>z</code> parameter in <code>rsmirnov</code> . Default is <code>NULL</code> .
<code>.alternative</code>	One of "two.sided" (default), "less", or "greater". Indicates the type of test statistic.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the Smirnov values. Default is <code>TRUE</code> .
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is <code>TRUE</code> .
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function generates random walks where each step is drawn from the Smirnov distribution using `rsmirnov()`. The user can control the number of walks, steps per walk, the `sizes` parameter (default `c(1, 1)`), and the `alternative` hypothesis. The parameter `z` can be provided or left as `NULL` (default). The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: [brownian_motion\(\)](#), [custom_walk\(\)](#), [discrete_walk\(\)](#), [double_pendulum_walk\(\)](#), [geometric_brownian_motion\(\)](#), [random_beta_walk\(\)](#), [random_binomial_walk\(\)](#), [random_cauchy_walk\(\)](#), [random_chisquared_walk\(\)](#), [random_displacement_walk\(\)](#), [random_exponential_walk\(\)](#), [random_f_walk\(\)](#), [random_gamma_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_logistic_walk\(\)](#), [random_lognormal_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_normal_drift_walk\(\)](#), [random_normal_walk\(\)](#), [random_poisson_walk\(\)](#), [random_t_walk\(\)](#), [random_uniform_walk\(\)](#), [random_weibull_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Other Discrete Distribution: [discrete_walk\(\)](#), [random_binomial_walk\(\)](#), [random_displacement_walk\(\)](#), [random_geometric_walk\(\)](#), [random_hypergeometric_walk\(\)](#), [random_multinomial_walk\(\)](#), [random_negbinomial_walk\(\)](#), [random_poisson_walk\(\)](#), [random_wilcox_walk\(\)](#), [random_wilcoxon_sr_walk\(\)](#)

Examples

```
set.seed(123)
random_smirnov_walk()

set.seed(123)
random_smirnov_walk(.dimensions = 2) |>
  head() |>
  t()
```

random_t_walk	<i>Generate Multiple Random t-Distributed Walks in Multiple Dimensions</i>
---------------	--

Description

The `random_t_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a t-distribution. The user can specify the number of walks, the number of steps in each walk, and the degrees of freedom for the t-distribution. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_t_walk(
  .num_walks = 25,
  .n = 100,
  .df = 5,
  .initial_value = 0,
  .ncp = 0,
```

```
.samp = TRUE,
.replace = TRUE,
.sample_size = 0.8,
.dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.df</code>	Degrees of freedom for the t-distribution. Default is 5.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.ncp</code>	A numeric value for the non-centrality parameter for the t-distribution. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the t-distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from a t-distribution. The user can control the number of walks, steps per walk, degrees of freedom, and optionally the non-centrality parameter (`ncp`). If `.ncp` is left blank, the function uses the default behavior of `rt()` from base R, which sets `ncp = 0`. The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.

- cum_prod: Cumulative product of `dplyr::all_of(.dimensions)`.
- cum_min: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- cum_max: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- cum_mean: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_uniform_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_t_walk()

set.seed(123)
random_t_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_uniform_walk	<i>Generate Multiple Random Uniform Walks in Multiple Dimensions</i>
---------------------	--

Description

The `random_uniform_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from a uniform distribution. The user can specify the number of walks, the number of steps in each walk, and the parameters of the uniform distribution (min and max). The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_uniform_walk(
  .num_walks = 25,
  .n = 100,
  .min = 0,
  .max = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100.
<code>.min</code>	A numeric value indicating the minimum of the uniform distribution. Default is 0.
<code>.max</code>	A numeric value indicating the maximum of the uniform distribution. Default is 1.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the uniform distribution values. Default is TRUE.
<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Details

This function is a flexible generator for random walks where each step is drawn from a uniform distribution. The user can control the number of walks, steps per walk, and the minimum and maximum values for the uniform distribution. The function supports 1, 2, or 3 dimensions, and augments the output with cumulative statistics for each walk. Sampling can be performed with or without replacement, and a proportion of steps can be sampled if desired.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.

- x, y: If `.dimensions = 2`, the values of the walk in two dimensions.
- x, y, z: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of x, y and or z:

- cum_sum: Cumulative sum of `dplyr::all_of(.dimensions)`.
- cum_prod: Cumulative product of `dplyr::all_of(.dimensions)`.
- cum_min: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- cum_max: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- cum_mean: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_weibull_walk()`

Examples

```
set.seed(123)
random_uniform_walk()

set.seed(123)
random_uniform_walk(dimensions = 3) |>
  head() |>
  t()
```

random_weibull_walk	<i>Generate Multiple Random Weibull Walks in Multiple Dimensions</i>
---------------------	--

Description

A Weibull random walk is a stochastic process in which each step is drawn from the Weibull distribution, a flexible distribution commonly used to model lifetimes, reliability, and extreme values. This function allows for the simulation of multiple independent random walks in one, two, or three dimensions, with user control over the number of walks, steps, and the shape and scale parameters of the Weibull distribution. Sampling options allow for further customization, including the ability to sample a proportion of steps and to sample with or without replacement. The resulting data frame includes cumulative statistics for each walk, making it suitable for simulation studies and visualization.

Usage

```
random_weibull_walk(
  .num_walks = 25,
  .n = 100,
  .shape = 1,
  .scale = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	Integer. Number of walks to generate. Default is 25.
<code>.n</code>	Integer. Number of steps in each walk. Default is 100.
<code>.shape</code>	Numeric. Shape parameter of the Weibull distribution. Default is 1.
<code>.scale</code>	Numeric. Scale parameter of the Weibull distribution. Default is 1.
<code>.initial_value</code>	Numeric. Starting value of the walk. Default is 0.
<code>.samp</code>	Logical. Whether to sample the steps. Default is TRUE.
<code>.replace</code>	Logical. Whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	Numeric. Proportion of steps to sample (0-1). Default is 0.8.
<code>.dimensions</code>	Integer. Number of dimensions (1, 2, or 3). Default is 1.

Details

The `random_weibull_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from the Weibull distribution using `stats::rweibull()`. The user can specify the number of walks, the number of steps in each

walk, and the parameters `.shape` and `.scale` for the Weibull distribution. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Value

A data frame with the random walks and cumulative statistics as columns.

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_wilcox_walk()`, `random_wilcoxon_sr_walk()`

Other Continuous Distribution: `brownian_motion()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_t_walk()`, `random_uniform_walk()`

Examples

```
set.seed(123)
random_weibull_walk()

set.seed(123)
random_weibull_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_wilcoxon_sr_walk

Generate Multiple Random Wilcoxon Signed-Rank Walks

Description

A Wilcoxon signed-rank random walk is a stochastic process in which each step is drawn from the Wilcoxon signed-rank distribution, commonly used in nonparametric statistics. This function allows for the simulation of multiple independent random walks in one, two, or three dimensions, with user control over the number of walks, steps, and the sample size parameter for the distribution. Sampling options allow for further customization, including the ability to sample a proportion of steps and to sample with or without replacement. The resulting data frame includes cumulative statistics for each walk, making it suitable for simulation studies and visualization.

Usage

```
random_wilcoxon_sr_walk(
  .num_walks = 25,
  .nn = 100,
  .n = 1,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

.num_walks	An integer specifying the number of random walks to generate. Default is 25.
.nn	An integer specifying the number of steps in each walk. Default is 100.
.n	Integer or vector. Number(s) of observations in the sample(s) for rsignrank. Default is 1.
.initial_value	Numeric. Starting value of the walk. Default is 0.
.samp	Logical. Whether to sample the steps. Default is TRUE.
.replace	Logical. Whether sampling is with replacement. Default is TRUE.

.sample_size Numeric. Proportion of steps to sample (0-1). Default is 0.8.
 .dimensions Integer. Number of dimensions (1, 2, or 3). Default is 1.

Details

The `random_wilcoxon_sr_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from the Wilcoxon signed-rank distribution using `stats::rsignrank()`. The user can specify the number of steps/periods (`nn`), the number of samples in each walk (`n`), and the number of dimensions. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcox_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcox_walk()`

Examples

```
set.seed(123)
random_wilcoxon_sr_walk()

set.seed(123)
random_wilcoxon_sr_walk(.dimensions = 3) |>
  head() |>
  t()
```

random_wilcox_walk	<i>Generate Multiple Random Wilcoxon Walks in Multiple Dimensions</i>
--------------------	---

Description

The `random_wilcox_walk` function generates multiple random walks in 1, 2, or 3 dimensions. Each walk is a sequence of steps where each step is a random draw from the Wilcoxon distribution using `stats::rwilcox()`. The user can specify the number of walks, the number of steps in each walk, and the parameters `.m` and `.n` for the Wilcoxon distribution. The function also allows for sampling a proportion of the steps and optionally sampling with replacement.

Usage

```
random_wilcox_walk(
  .num_walks = 25,
  .n = 100,
  .m = 10,
  .k = 10,
  .initial_value = 0,
  .samp = TRUE,
  .replace = TRUE,
  .sample_size = 0.8,
  .dimensions = 1
)
```

Arguments

<code>.num_walks</code>	An integer specifying the number of random walks to generate. Default is 25.
<code>.n</code>	An integer specifying the number of steps in each walk. Default is 100. (Maps to <code>nn</code> in <code>rwilcox()</code>)
<code>.m</code>	Number of observations in the first sample for Wilcoxon. Default is 10.
<code>.k</code>	Number of observations in the second sample for Wilcoxon. Default is 10.
<code>.initial_value</code>	A numeric value indicating the initial value of the walks. Default is 0.
<code>.samp</code>	A logical value indicating whether to sample the Wilcoxon values. Default is TRUE.

<code>.replace</code>	A logical value indicating whether sampling is with replacement. Default is TRUE.
<code>.sample_size</code>	A numeric value between 0 and 1 specifying the proportion of <code>.n</code> to sample. Default is 0.8.
<code>.dimensions</code>	An integer specifying the number of dimensions (1, 2, or 3). Default is 1.

Value

A tibble containing the generated random walks with columns depending on the number of dimensions:

- `walk_number`: Factor representing the walk number.
- `step_number`: Step index.
- `y`: If `.dimensions = 1`, the value of the walk at each step.
- `x, y`: If `.dimensions = 2`, the values of the walk in two dimensions.
- `x, y, z`: If `.dimensions = 3`, the values of the walk in three dimensions.

The following are also returned based upon how many dimensions there are and could be any of `x`, `y` and or `z`:

- `cum_sum`: Cumulative sum of `dplyr::all_of(.dimensions)`.
- `cum_prod`: Cumulative product of `dplyr::all_of(.dimensions)`.
- `cum_min`: Cumulative minimum of `dplyr::all_of(.dimensions)`.
- `cum_max`: Cumulative maximum of `dplyr::all_of(.dimensions)`.
- `cum_mean`: Cumulative mean of `dplyr::all_of(.dimensions)`.

The tibble includes attributes for the function parameters.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Generator Functions: `brownian_motion()`, `custom_walk()`, `discrete_walk()`, `double_pendulum_walk()`, `geometric_brownian_motion()`, `random_beta_walk()`, `random_binomial_walk()`, `random_cauchy_walk()`, `random_chisquared_walk()`, `random_displacement_walk()`, `random_exponential_walk()`, `random_f_walk()`, `random_gamma_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_logistic_walk()`, `random_lognormal_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_normal_drift_walk()`, `random_normal_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_t_walk()`, `random_uniform_walk()`, `random_weibull_walk()`, `random_wilcoxon_sr_walk()`

Other Discrete Distribution: `discrete_walk()`, `random_binomial_walk()`, `random_displacement_walk()`, `random_geometric_walk()`, `random_hypergeometric_walk()`, `random_multinomial_walk()`, `random_negbinomial_walk()`, `random_poisson_walk()`, `random_smirnov_walk()`, `random_wilcoxon_sr_walk()`

Examples

```

set.seed(123)
random_wilcox_walk()

set.seed(123)
random_wilcox_walk(.dimensions = 2) |>
  head() |>
  t()

```

rand_walk_column_names

Get Column Names

Description

This function generates the column names of a rand walk data frame.

Usage

```
rand_walk_column_names(.rand_data, .dim_names, .num_sims, .t)
```

Arguments

<code>.rand_data</code>	A data frame from which column names are to be extracted.
<code>.dim_names</code>	The dimnames passed from the rand walk function.
<code>.num_sims</code>	The number of simulations.
<code>.t</code>	The periods in the walk

Details

The `rand_walk_column_names` function takes a data frame as input and returns the rand walk data with column names.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

rand_walk_helper	<i>Random Walk Helper</i>
------------------	---------------------------

Description

A function to help build random walks by mutating a data frame.

Usage

```
rand_walk_helper(.data, .value)
```

Arguments

.data	The data frame to mutate.
.value	The .initial_value to use. This is passed from the random walk function being called by the end user.

Details

A function to help build random walks by mutating a data frame. This mutation adds the following columns to the data frame: cum_sum, cum_prod, cum_min, cum_max, and cum_mean. The function is used internally by certain functions that generate random walks.

Value

A modified data frame/tibble with the following columns added:

- cum_sum: Cumulative sum of y.
- cum_prod: Cumulative product of y.
- cum_min: Cumulative minimum of y.
- cum_max: Cumulative maximum of y.
- cum_mean: Cumulative mean of y.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
df <- data.frame(
  walk_number = factor(rep(1L:25L, each = 30L)),
  x = rep(1L:30L, 25L),
  y = rnorm(750L, 0L, 1L)
)

rand_walk_helper(df, 100)
```

running_quantile	<i>Running Quantile Calculation</i>
------------------	-------------------------------------

Description

The `running_quantile` function calculates the quantile of a vector over a sliding window, allowing for various alignment and rule options.

Usage

```
running_quantile(
  .x,
  .window,
  .probs = 0.5,
  .type = 7,
  .rule = "quantile",
  .align = "center"
)
```

Arguments

- | | |
|----------------------|---|
| <code>.x</code> | A numeric vector for which the running quantile is to be calculated. |
| <code>.window</code> | An integer specifying the size of the sliding window. |
| <code>.probs</code> | A numeric value between 0 and 1 indicating the desired quantile probability (default is 0.50). |
| <code>.type</code> | An integer from 1 to 9 specifying the quantile algorithm type (default is 7). |
| <code>.rule</code> | A character string indicating the rule to apply at the edges of the window. Possible choices are: <ul style="list-style-type: none"> "quantile": Standard quantile calculation. "trim": Trims the output to remove values outside the window. "keep": Keeps the original values at the edges of the window. "constant": Fills the edges with the constant value from the nearest valid quantile. "NA": Fills the edges with NA values. |

- "func": Applies a custom function to the values in the window (default is "quantile").
- `.align` A character string specifying the alignment of the window ("center", "left", or "right"; default is "center").

Details

This function computes the running quantile of a numeric vector using a specified window size and probability.

Value

A numeric vector containing the running quantile values.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
# Example usage of running_quantile
set.seed(123)
data <- cumsum(rnorm(50))
result <- running_quantile(data, .window = 3, .probs = 0.5)
print(result)

plot(data, type = "l")
lines(result, col = "red")
```

Description

Generate Random Walks

Usage

```
rw30()
```

Details

The function generates random walks using the normal distribution with a specified mean (μ) and standard deviation (σ). Each walk is generated independently and stored in a tibble. The resulting tibble is then pivoted into a long format for easier analysis.

Value

A tibble in long format with columns walk, x, and value, representing the random walks. Additionally, attributes num_walks, num_steps, mu, and sd are attached to the tibble.

Author(s)

Steven P. Sanderson II, MPH

This function generates 30 random walks with 100 steps each and pivots the result into a long format tibble.

Examples

```
# Generate random walks and print the result
set.seed(123)
rw30()

set.seed(123)
rw30() |>
  visualize_walks()
```

 rw_range

Range

Description

A function to return the range of a vector.

Usage

```
rw_range(.x)
```

Arguments

.x A numeric vector

Details

A function to return the range of a vector. It uses $\max(.x) - \min(.x)$ as the basis of the function.

Value

A numeric vector

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Vector Function: [cgmean\(\)](#), [chmean\(\)](#), [ckurtosis\(\)](#), [cmean\(\)](#), [cmedian\(\)](#), [crange\(\)](#), [csd\(\)](#), [cskewness\(\)](#), [cvar\(\)](#), [euclidean_distance\(\)](#), [kurtosis_vec\(\)](#), [skewness_vec\(\)](#)

Examples

```
x <- mtcars$mpg
rw_range(x)
```

skewness_vec

*Compute Skewness of a Vector***Description**

This function takes in a vector as it's input and will return the skewness of that vector. The length of this vector must be at least four numbers. The skewness explains the 'tailedness' of the distribution of data.

$$\frac{\frac{1}{n} \sum (x - \mu)^3}{\left(\frac{1}{n} \sum (x - \mu)^2\right)^{3/2}}$$

Usage

```
skewness_vec(.x)
```

Arguments

`.x` A numeric vector of length four or more.

Details

A function to return the skewness of a vector.

Value

The skewness of a vector

Author(s)

Steven P. Sanderson II, MPH

See Also

<https://en.wikipedia.org/wiki/Skewness>

Other Vector Function: `cgmean()`, `chmean()`, `ckurtosis()`, `cmean()`, `cmedian()`, `crange()`, `csd()`, `cskewness()`, `cvar()`, `euclidean_distance()`, `kurtosis_vec()`, `rw_range()`

Examples

```
set.seed(123)
skewness_vec(rnorm(100, 3, 2))
```

std_cum_max_augment	<i>Augment Cumulative Maximum</i>
---------------------	-----------------------------------

Description

This function augments a data frame by adding cumulative maximum columns for specified variables.

Usage

```
std_cum_max_augment(.data, .value, .names = "auto", .initial_value = 0)
```

Arguments

<code>.data</code>	A data frame to augment.
<code>.value</code>	A column name or names for which to compute the cumulative maximum.
<code>.names</code>	Optional. A character vector of names for the new cumulative maximum columns. Defaults to "auto", which generates names based on the original column names.
<code>.initial_value</code>	A numeric value to start the cumulative maximum from. Defaults to 0.

Details

The function takes a data frame and a column name (or names) and computes the cumulative maximum for each specified column, starting from an initial value. If the column names are not provided, it will throw an error.

Value

A tibble with the original data and additional columns containing the cumulative maximums.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
df <- data.frame(x = c(1, 3, 2, 5, 4), y = c(10, 7, 6, 12, 5))
std_cum_max_augment(df, .value = x)
std_cum_max_augment(df, .value = y, .names = c("cummax_y"))
```

std_cum_mean_augment	<i>Augment Cumulative Sum</i>
----------------------	-------------------------------

Description

This function augments a data frame by adding cumulative mean columns for specified variables.

Usage

```
std_cum_mean_augment(.data, .value, .names = "auto", .initial_value = 0)
```

Arguments

<code>.data</code>	A data frame to augment.
<code>.value</code>	A column name or names for which to compute the cumulative mean.
<code>.names</code>	Optional. A character vector of names for the new cumulative mean columns. Defaults to "auto", which generates names based on the original column names.
<code>.initial_value</code>	A numeric value to start the cumulative mean from. Defaults to 0.

Details

The function takes a data frame and a column name (or names) and computes the cumulative mean for each specified column, starting from an initial value. If the column names are not provided, it will throw an error.

Value

A tibble with the original data and additional columns containing the cumulative means.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
df <- data.frame(x = c(1, 2, 3, 4, 5), y = c(10, 20, 30, 40, 50))
std_cum_mean_augment(df, .value = x)
std_cum_mean_augment(df, .value = y, .names = c("cummean_y"))
```

std_cum_min_augment	<i>Augment Cumulative Minimum</i>
---------------------	-----------------------------------

Description

This function augments a data frame by adding cumulative minimum columns for specified variables.

Usage

```
std_cum_min_augment(.data, .value, .names = "auto", .initial_value = 0)
```

Arguments

<code>.data</code>	A data frame to augment.
<code>.value</code>	A column name or names for which to compute the cumulative minimum.
<code>.names</code>	Optional. A character vector of names for the new cumulative minimum columns. Defaults to "auto", which generates names based on the original column names.
<code>.initial_value</code>	A numeric value to start the cumulative minimum from. Defaults to 0.

Details

The function takes a data frame and a column name (or names) and computes the cumulative minimum for each specified column, starting from an initial value. If the column names are not provided, it will throw an error.

Value

A tibble with the original data and additional columns containing the cumulative minimums.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
df <- data.frame(x = c(5, 3, 8, 1, 4), y = c(10, 7, 6, 12, 5))
std_cum_min_augment(df, .value = x)
std_cum_min_augment(df, .value = y, .names = c("cummin_y"))
```

std_cum_prod_augment *Augment Cumulative Product*

Description

This function augments a data frame by adding cumulative product columns for specified variables.

Usage

```
std_cum_prod_augment(.data, .value, .names = "auto", .initial_value = 1)
```

Arguments

<code>.data</code>	A data frame to augment.
<code>.value</code>	A column name or names for which to compute the cumulative product.
<code>.names</code>	Optional. A character vector of names for the new cumulative product columns. Defaults to "auto", which generates names based on the original column names.
<code>.initial_value</code>	A numeric value to start the cumulative product from. Defaults to 1.

Details

The function takes a data frame and a column name (or names) and computes the cumulative product for each specified column, starting from an initial value. If the column names are not provided, it will throw an error.

Value

A tibble with the original data and additional columns containing the cumulative products.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: `confidence_interval()`, `convert_snake_to_title_case()`, `generate_caption()`, `get_attributes()`, `rand_walk_column_names()`, `rand_walk_helper()`, `running_quantile()`, `std_cum_max_augment()`, `std_cum_mean_augment()`, `std_cum_min_augment()`, `std_cum_sum_augment()`, `subset_walks()`

Examples

```
df <- data.frame(x = 1:5, y = 6:10)
std_cum_prod_augment(df, .value = x)
std_cum_prod_augment(df, .value = y, .names = c("cumprod_y"))
```

std_cum_sum_augment	<i>Augment Cumulative Sum</i>
---------------------	-------------------------------

Description

This function augments a data frame by adding cumulative sum columns for specified variables.

Usage

```
std_cum_sum_augment(.data, .value, .names = "auto", .initial_value = 0)
```

Arguments

<code>.data</code>	A data frame to augment.
<code>.value</code>	A column name or names for which to compute the cumulative sum.
<code>.names</code>	Optional. A character vector of names for the new cumulative sum columns. Defaults to "auto", which generates names based on the original column names.
<code>.initial_value</code>	A numeric value to start the cumulative sum from. Defaults to 0.

Details

The function takes a data frame and a column name (or names) and computes the cumulative sum for each specified column, starting from an initial value. If the column names are not provided, it will throw an error.

Value

A tibble with the original data and additional columns containing the cumulative sums.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [subset_walks\(\)](#)

Examples

```
df <- data.frame(x = 1:5, y = 6:10)
std_cum_sum_augment(df, .value = x)
std_cum_sum_augment(df, .value = y, .names = c("cumsum_y"))
```

subset_walks	<i>Subset Walks by Extreme Values</i>
--------------	---------------------------------------

Description

This function subsets random walks to identify the walk with the maximum or minimum value.

Usage

```
subset_walks(.data, .type = "max", .value = "y")
```

Arguments

- .data A data frame containing random walks. It must have columns walk_number and the specified value column.
- .type A character string specifying the type of subset: "max" for maximum value, "min" for minimum value, or "both" for both maximum and minimum values.
- .value A character string specifying the column name to use for finding extreme values. Defaults to "y".

Details

The subset_walks function takes a data frame containing random walks and subsets it to return the walk with the maximum or minimum value based on the specified type. It requires that the input data frame contains columns walk_number and the specified value column.

Value

A data frame containing the subset walk.

Author(s)

Steven P. Sanderson II, MPH

See Also

Other Utility Functions: [confidence_interval\(\)](#), [convert_snake_to_title_case\(\)](#), [generate_caption\(\)](#), [get_attributes\(\)](#), [rand_walk_column_names\(\)](#), [rand_walk_helper\(\)](#), [running_quantile\(\)](#), [std_cum_max_augment\(\)](#), [std_cum_mean_augment\(\)](#), [std_cum_min_augment\(\)](#), [std_cum_prod_augment\(\)](#), [std_cum_sum_augment\(\)](#)

Examples

```
set.seed(123)
df <- rw30()
subset_walks(df, .type = "max")
subset_walks(df, .type = "min")
subset_walks(df, .type = "both")

# Example with a specific value column
set.seed(123)
discrete_walk() |>
  subset_walks(.type = "both", .value = "cum_sum_y") |>
  visualize_walks(.pluck = 2)
```

summarize_walks

*Summarize Walks Data***Description**

Summarizes random walk data by computing statistical measures.

Usage

```
summarize_walks(.data, .value, .group_var = NULL)

summarise_walks(.data, .value, .group_var = NULL)
```

Arguments

<code>.data</code>	A data frame or tibble containing random walk data.
<code>.value</code>	A column name (unquoted) representing the value to summarize.
<code>.group_var</code>	An optional column name (unquoted) representing the grouping variable. Defaults to NULL for one overall summary across all walks.

Details

This function requires that the input data frame contains a column named 'walk_number' and that the value to summarize is provided. It computes statistics such as mean, median, variance, and quantiles for the specified value variable. Omit `.group_var` or set it to NULL for an overall summary, ignoring any existing grouping on the input. Supply a grouping column to summarize only by that column. Dimension metadata is read from `dimensions`, falling back to the legacy dimension attribute. If neither is present, `dimensions` is `NA_integer_`.

Value

A tibble containing the summarized statistics for each group, including mean, median, range, quantiles, variance, standard deviation, and more.

Author(s)

Steven P. Sanderson II, MPH

Examples

```
library(dplyr)

# Example data frame
walk_data <- random_normal_walk(.initial_value = 100)

# Summarize by walk
summarize_walks(walk_data, cum_sum_y, walk_number) |>
  glimpse()
# Overall summary (omitted grouping and explicit NULL are equivalent)
summarize_walks(walk_data, y) |>
  glimpse()
summarize_walks(walk_data, y, .group_var = NULL) |>
  glimpse()

# Example with missing value variable
# summarize_walks(walk_data, NULL, group) # This will trigger an error.
```

visualize_walks

Visualize Walks

Description

visualize_walks() visualizes the output of the random walk functions in the RandomWalker package, resulting in one or more ggplot2 plots put together in a patchwork composed of 1 or more patches.

Usage

```
visualize_walks(.data, .alpha = 0.7, .interactive = FALSE, .pluck = FALSE)
```

Arguments

<code>.data</code>	The input data. Assumed to be created by one of the random walk functions in the RandomWalker package, but can be any data frame or tibble that contains columns walk_number, step_number, and one or more numeric columns like y, x, z, cum_sum_y, cum_prod_y, cum_min_y, cum_max_y, and cum_mean_y, for instance.
--------------------	---

<code>.alpha</code>	The alpha value for all the line charts in the visualization. Values range from 0 to 1. Default is 0.7.
<code>.interactive</code>	A boolean value. TRUE if you want the patches to be interactive. FALSE if you don't. Default is FALSE.
<code>.pluck</code>	If you want to visualize only one or more plots, supply a numeric vector of plot indices or a character vector of plotted column names. Exact column names such as <code>y</code> , <code>cum_sum_y</code> , or <code>cum_sum_x</code> are supported. Short cumulative aliases such as <code>cum_sum</code> are supported only when they match exactly one plotted column. Default is FALSE.

Details

`visualize_walks()` generates visualizations of the random walks generated by the random walk functions in the RandomWalker package. These are the functions at the moment of writing:

- `brownian_motion()`
- `discrete_walk()`
- `geometric_brownian_motion()`
- `random_normal_drift_walk()`
- `random_normal_walk()`
- `rw30()`

It is possible there are more when you read this, but you can check the rest of the documentation for the current situation.

The visualization function is meant to be easy to use. No parameters needed, but you can set `.alpha` if the default value of 0.7 isn't to your liking.

You can also choose whether you want the visualization to be interactive or not by setting `.interactive` to TRUE. The function uses the `ggiraph` package for making the patches interactive.

If you want to visualize only one of the attributes, use `.pluck` with a numeric plot index or the exact column name to plot. Generator functions with cumulative statistics use dimension-suffixed column names such as `cum_sum_y`, `cum_sum_x`, and `cum_sum_z`. Short cumulative aliases such as `cum_sum` are also accepted when they match exactly one plotted column.

Value

A patchwork composed of 1 or more patches

Author(s)

Antti Lennart Rask

See Also

Other Visualization Functions: [animate_double_pendulum\(\)](#), [plot_double_pendulum\(\)](#)

Examples

```
# Generate random walks and visualize the result
set.seed(123)
rw30() |>
  visualize_walks()

# Use the function to create interactive visualizations
set.seed(123)
random_normal_walk(.num_walks = 5, .initial_value = 100) |>
  visualize_walks(.interactive = TRUE)

# Use .pluck to pick just one visualization
set.seed(123)
random_normal_walk(.num_walks = 5, .initial_value = 100) |>
  visualize_walks(.pluck = c(1, 3))

# Use an exact suffixed cumulative column name
set.seed(123)
random_normal_walk(.num_walks = 5, .initial_value = 100) |>
  visualize_walks(.pluck = "cum_sum_y")
```

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