

Package: ProbBayes (via r-universe)

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Type Package

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URL <https://github.com/bayesball/ProbBayes>

License GPL (>= 2)

Description Functions and datasets to accompany J. Albert and J. Hu, "Probability and Bayesian Modeling", CRC Press, (2019, ISBN: 1138492566).

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animation_ratings *Movie Ratings*

Description

Ratings for a set of 2010 animation movies

Usage

```
animation_ratings
```

Format

A data frame with 55 observations on the following 6 variables.

userId user ID

movieId movie ID

rating numerical rating

timestamp time when the rating was recorded

title name of the movie

Group_Number numerical ID of movie

Source

MovieLens by GroupLens Research

arm_height	<i>Arm span and height measurements</i>
------------	---

Description

Arm span and height measurements for a sample of students

Usage

```
arm_height
```

Format

A data frame with 20 observations on the following 2 variables.

arm length of arm span in cm

height height in cm

Source

Sample of college students

bar_plot	<i>Bar plot of numeric or character data</i>
----------	--

Description

Constructs frequency bar plot of a vector of numeric data or a vector of character data

Usage

```
bar_plot(y, ...)
```

Arguments

y vector of outcomes

... title of the graph

Value

A ggplot2 object containing the bar graph.

Author(s)

Jim Albert

Examples

```
s <- spinner_data(c(1, 2, 2, 1), nsim=100)
bar_plot(s, "Spinner Data")
y <- c(rep("a", 10), rep("b", 5),
      rep("c", 8), rep("d", 4))
bar_plot(y)
```

`batting_2018`*Batting Statistics for 2018 Season*

Description

Batting statistics collected for all players during the first month and remainder of 2018 baseball season

Usage`batting_2018`**Format**

A data frame with 549 observations on the following 5 variables.

Name name of player

AB.x number of at bats in first month

H.x number of hits in first month

AB.y number of at bats in remainder of season

H.y number of hits in remainder of season

Source

Data collected from Retrosheet.org.

bayesian_crank

Computes Posterior Probabilities for Discrete Models

Description

Given a data table with columns Prior and Likelihood, computes posterior probabilities

Usage

```
bayesian_crank(d)
```

Arguments

d data frame with columns Prior and Likelihood

Value

data frame with new columns Product and Posterior

Author(s)

Jim Albert

Examples

```
df <- data.frame(p=c(.1, .3, .5, .7, .9),
                 Prior=rep(1/5, 5))
y <- 5
n <- 10
df$Likelihood <- dbinom(y, prob=df$p, size=n)
df <- bayesian_crank(df)
```

BBS_survey*Trend Estimates of Bird Populations*

Description

Trend Estimates for 28 Grassland Bird Species

Usage

```
BBS_survey
```

Format

A data frame with 28 observations on the following 4 variables.

Species_Name name of bird species

Trend trend estimate

SE standard error of estimate

N_Site number of observations at site

Source

North American Breeding Bird Survey

beta_area

Displays Areas Under a Beta Curve

Description

Computes and Displays Areas Under a Beta Curve

Usage

```
beta_area(lo, hi, shape_par, Color = "orange")
```

Arguments

lo lower bound of interval

hi upper bound of interval

shape_par vector of shape parameters of the beta curve

Color color of shading in the graph

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
lo <- .2
hi <- .4
shape_par <- c(2, 5)
beta_area(lo, hi, shape_par)
```

beta_data	<i>Simulate random data from a beta curve</i>
-----------	---

Description

Simulate random data from a beta curve

Usage

```
beta_data(shape_par, nsim=1000)
```

Arguments

shape_par	vector of shape parameters of the beta curve
nsim	number of simulations

Value

A vector of random draws from the beta distribution

Author(s)

Jim Albert

Examples

```
shape_par <- c(12, 8)
beta_data(shape_par, 10)
```

beta_draw	<i>Draw a Beta Curve</i>
-----------	--------------------------

Description

Draw a Beta Curve

Usage

```
beta_draw(shape_pars)
```

Arguments

shape_pars	vector of shape parameters of the beta curve
------------	--

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
shape_pars <- c(2, 5)
beta_draw(shape_pars)
```

beta_interval *Probability Interval for a Beta Curve*

Description

Computes Probability Interval for a Beta Curve

Usage

```
beta_interval(prob, shape_par, Color = "orange")
```

Arguments

prob	value of coverage probability
shape_par	vector of shape parameters of the beta curve
Color	color of shading in the graph

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
shape_par <- c(2, 5)
beta_interval(.5, shape_par)
```

beta_prior_post *Plot of Two Beta Curves*

Description

Plot of Prior and Posterior Beta Curves

Usage

```
beta_prior_post(prior_shapes, post_shapes)
```

Arguments

prior_shapes vector of shape parameters of the beta prior
post_shapes vector of shape parameters of the beta posterior

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
prior_shapes <- c(4, 6)  
post_shapes <- c(19, 16)  
beta_prior_post(prior_shapes, post_shapes)
```

beta_quantile *Displays a Quantile of a Beta Curve*

Description

Displays a Quantile of a Beta Curve

Usage

```
beta_quantile(prob, shape_par, Color = "orange")
```

Arguments

prob probability value of interest
shape_par vector of shape parameters of the beta curve
Color color of shading in the graph

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
# find the .50 quantile (the median)
prob <- 0.5
shape_par <- c(2, 5)
beta_quantile(prob, shape_par)
# find the .90 quantile (90th percentile)
prob <- 0.9
beta_quantile(prob, shape_par)
```

book_stats

Text Statistics for Books

Description

Text statistics for a collection of books sold at Amazon.com

Usage

```
book_stats
```

Format

A data frame with 21 observations on the following 3 variables.

Book name of book

Complex.Words percentage of words in the book with three or more syllables

Fog.Index number of years of formal education required to read and understand a passage of text

Source

Data collected from Amazon.com website.

buffalo_jan *Buffalo snowfall data*

Description

Total snowfall in inches for 20 Januarys in Buffalo, New York

Usage

buffalo_jan

Format

A data frame with 20 observations on the following 2 variables.

SEASON Season

JAN inches of total snowfall

Source

National Weather Service, www.weather.gov

career_1978 *Career Trajectory Data for Baseball Players*

Description

Season on-base statistics for collection of MLB baseball players who were born in 1978

Usage

career_1978

Format

A data frame with 399 observations on the following 6 variables.

nameLast last name of player

Player id of player

Age age of player

AgeD deviation of age from 30

PA number of plate appearances

OB number of on-base events

Source

Data collected from Lahman database.

centertitle	<i>Centers title in a ggplot2 graphic</i>
-------------	---

Description

Centers and increases font size of a ggplot2 graphic title

Usage

```
centertitle(Color = "blue")
```

Arguments

Color color of the text in the ggplot2 title

Value

ggplot2 theme code to center the title

Author(s)

Jim Albert

Examples

```
df <- data.frame(p=c(.1, .3, .5, .7, .9),
                 Prior=rep(1/5, 5))
ggplot(df, aes(p, Prior)) +
  geom_point() +
  ggtitle("My Prior") +
  centertitle()
```

CEsample	<i>Expeditures of U.S. Households</i>
----------	---------------------------------------

Description

Expeditures of U.S. Households

Usage

```
CEsample
```

Format

A data frame with 1000 observations on the following 3 variables.

UrbanRural urban/rural status of CU - 1 = urban and 2 = rural

TotalIncomeLastYear amount of CU income before taxes in the last 12 months

TotalExpLastQ CU's total expenditure in the last quarter

Source

U.S. Bureau of Labor Statistics

ChooseBeta

Shiny App to Choose a Beta Curve

Description

Interactively choose beta curve by selecting the .5 and .9 quantiles

Usage

ChooseBeta()

Value

None

Author(s)

Jim Albert

ComputerPriceSample

Personal Computer Data

Description

Variables on a sample of personal computers

Usage

ComputerPriceSample

Format

A data frame with 500 observations on the following 5 variables.

Price sales price

Speed clock speed in MHz

HardDrive size of hard drive in MB

Ram size of Ram in MB

Premium premium status of manufacturer

Source

Unknown

Cowles

Personality and Volunteering

Description

Data from study to learn about personality determinants of volunteering

Usage

Cowles

Format

A data frame with 1421 observations on the following 5 variables.

subject subject number

neuroticism measurement of neuroticism

extraversion measurement of extraversion

sex male or female

volunteer no or yes

Source

Unknown.

DeathHeartAttackDataNYCfull

Risk-adjusted mortality outcomes for all NYC hospitals

Description

Reported deaths from heart attack for hospitals in New York City

Usage

DeathHeartAttackDataNYCfull

Format

A data frame with 45 observations on the following 5 variables.

Hospital name of hospital

Borough borough in New York City

Type type of hospital

Cases number of heart attach cases

Deaths number of deaths

Source

New York State Department of Health

DeathHeartAttackManhattan

Risk-adjusted mortality outcomes for Manhattan hospitals

Description

Reported deaths from heart attack for hospitals in Manhattan in New York City

Usage

DeathHeartAttackManhattan

Format

A data frame with 13 observations on the following 4 variables.

Hospital name of hospital

Type type of hospital

Cases number of heart attach cases

Deaths number of deaths

Source

New York State Department of Health

draw_two_p	<i>Plot of Distribution of Two Proportions</i>
------------	--

Description

Constructs a graph of the probability distribution of two proportions

Usage

```
draw_two_p(prob_matrix, ...)
```

Arguments

prob_matrix	matrix of probabilities of two proportions with the rows and columns labeled by the values
...	other arguments such as the title of the plot

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
prob_matrix <- testing_prior()
draw_two_p(prob_matrix, title="Testing Prior")
```

dsampling	<i>Hypergeometric sampling density</i>
-----------	--

Description

Hypergeometric sampling density

Usage

```
dsampling(sample_b, pop_N, pop_B, sample_n)
```

Arguments

sample_b	number of black balls in sample
pop_N	number of balls in population
pop_B	number of black balls in population
sample_n	number of balls in sample

Value

Value of hypergeometric sampling probability

Author(s)

Jim Albert

Examples

```
pop_N <- 10
pop_B <- 4
sample_n <- 3
sample_b <- 2
dsampling(sample_b, pop_N, pop_B, sample_n)
```

dspinner

Computes likelihoods for spinner outcomes

Description

Computes likelihoods for spinner outcomes

Usage

```
dspinner(x, Prob)
```

Arguments

x	vector of spinner observations
Prob	matrix of spinner probabilities where each row corresponds to a different spinner

Value

column vector consisting of the likelihoods for the different spinners

Author(s)

Jim Albert

Examples

```
Prob <- matrix(c(.25, .25, .25, .25,
                .50, .125, .125, .5,
                .25, .5, .25, 0), 3, 4, byrow=TRUE)
x <- c(1, 2, 1, 3, 4)
dspinner(x, Prob)
```

electricbills	<i>Electricity Bills</i>
---------------	--------------------------

Description

Electricity bills collected for all months for five years

Usage

```
electricbills
```

Format

A data frame with 62 observations on the following 3 variables.

Year year

Month number of month

Amount electricity bill in dollars

Source

Data collected for one household in Ohio

federalist_word_study	<i>Frequency use of words for Federalist Papers</i>
-----------------------	---

Description

Frequency use of words for Federalist Papers written by either Alexander Hamilton or James Madison

Usage

```
federalist_word_study
```

Format

A data frame with 56853 observations on the following 7 variables.

Name name of Federalist paper

Total total number of words

word word that is counted

N frequency of the word

Rate fraction of words with that word

Authorship author of paper

Disputed is authorship disputed?

Source

<http://www.gutenberg.org/ebooks/18>

federer_time_to_serve *Times to Serve for Roger Federer*

Description

Measurements of time to serve for 20 serves of the tennis player Roger Federer

Usage

```
federer_time_to_serve
```

Format

A data frame with 20 observations on the following one variable.

time time to serve in seconds

Source

<https://github.com/JeffSackmann>

fire_calls	<i>Fire Calls for Zip Code Areas</i>
------------	--------------------------------------

Description

The number of fire calls and building fires for ten zip codes in Montgomery County, Pennsylvania

Usage

```
fire_calls
```

Format

A data frame with 10 observations on the following 3 variables.

Zip_Code zip code

Fire_Calls number of fire calls

Building_Fires number of building fires

Source

kaggle.com

football_field_goals	<i>Football Field Goals Dataset</i>
----------------------	-------------------------------------

Description

Field goal attempt data for three seasons of professional football

Usage

```
football_field_goals
```

Format

A data frame with 3025 observations on the following 5 variables.

Team name of team

Year football season

Kicker last name of kicker

Distance distance in feet of attempt

Success attempt was successful (1) or not (0)

Source

Data collected by Michael Lopez.

gas2017

Gas bill data

Description

Measurements of average temperature and natural gas bill for each month in 2017

Usage

```
gas2017
```

Format

A data frame with 12 observations on the following 3 variables.

Month abbreviation of month

Temp average temperature

Bill natural gas bill in dollars

Source

Personal data collected by a homeowner in Ohio

gibbs_betabin

Gibbs sampling of the beta-binomial distribution

Description

Implements Gibbs sampling of the beta-binomial distribution

Usage

```
gibbs_betabin(n, a, b, p = 0.5, iter = 1000)
```

Arguments

n	binomial sample size
a	first beta shape parameter
b	second beta shape parameter
p	starting value of proportion in algorithm
iter	number of iterations

Value

matrix of simulated draws from the algorithm

Author(s)

Jim Albert

Examples

```
sp <- gibbs_betabin(20, 5, 5, 100)
```

`gibbs_discrete`*Gibbs sampling of a bivariate discrete distribution*

Description

Implements Gibbs sampling for an arbitrary bivariate discrete distribution

Usage

```
gibbs_discrete(p, i = 1, iter = 1000)
```

Arguments

<code>p</code>	matrix defining the probability distribution
<code>i</code>	starting row of the matrix
<code>iter</code>	number of cycles of algorithm

Value

matrix of simulated draws from algorithm

Author(s)

Jim Albert

Examples

```
p <- matrix(c(4, 3, 2, 1,
             3, 4, 3, 2,
             2, 3, 4, 3,
             1, 2, 3, 4) / 40, 4, 4, byrow = TRUE)
out <- gibbs_discrete(p, 1, 100)
```

gibbs_normal

Gibbs sampling of the normal sampling posterior

Description

Implements Gibbs sampling for normal sampling with independent priors on the mean and precision

Usage

```
gibbs_normal(s, P = 0.002, iter = 1000)
```

Arguments

s a list with components `y`, the observed data, `mu0`, the prior mean of `mu`, `sigma0`, the prior standard deviation of `mu`, `a`, the shape parameter of the gamma prior on `P`, `b`, the rate parameter of the gamma prior on `P`

P starting value of the precision parameter

iter number of iterations

Value

matrix of simulated draws of `(mu, P)` from the algorithm

Author(s)

Jim Albert

Examples

```
s <- list(y = rnorm(20, 5, 2),
          mu0 = 10, sigma0 = 3, a = 1, b = 1)
out <- gibbs_normal(s, P = 0.01, iter=100)
```

GradSchoolAdmission*Graduate School Admission*

Description

Study to see what variables are helpful in determining admission to Graduate School

Usage

```
GradSchoolAdmission
```


Format

A data frame with 400 observations on the following 3 variables.

Admission student was admitted (1) or not admitted (0)

GRE GRE score

GPA grade point average

Source

Unknown.

Hamilton_can

Frequency use of "can" for Federalist Papers

Description

Frequency use of "can" for Federalist Papers written by Alexander Hamilton

Usage

Hamilton_can

Format

A data frame with 49 observations on the following 6 variables.

Name name of Federalist paper

Total total number of words

word word that is counted

N frequency of the word

Rate fraction of words with that word

Authorship author of paper

Source

<http://www.gutenberg.org/ebooks/18>

house_prices *House price data*

Description

Measurements of house size and selling price for a collection of homes in a city in Ohio

Usage

house_prices

Format

A data frame with 24 observations on the following 2 variables.

price selling price in \$1000

size square footage of house

Source

Zillow.com

HWhours5schools *Homework Hours for Five Schools*

Description

Weekly hours spent on homework for students from five schools

Usage

HWhours5schools

Format

A data frame with 116 observations on the following 2 variables.

school school number of student

hours weekly hours spent on homework

Source

Unknown.

increasefont	<i>Increases font size of text</i>
--------------	------------------------------------

Description

Increases font size on all text in a ggplot2 graphic

Usage

```
increasefont(Size = 18)
```

Arguments

Size font size of all textual elements in a ggplot2 graphic

Value

ggplot2 theme code to increase the font size

Author(s)

Jim Albert

Examples

```
df <- data.frame(p=c(.1, .3, .5, .7, .9),
                 Prior=rep(1/5, 5))
ggplot(df, aes(p, Prior)) +
  geom_point() + increasefont()
```

JAGS_script	<i>JAGS Script for Common Models</i>
-------------	--------------------------------------

Description

Model script for JAGS to fit a particular Bayesian model. Currently the possible models are "beta_binomial", "hier_normal", "hier_trajectory", "normal", "regression", "regression_cond_means", and "trajectory".

Usage

```
JAGS_script(model)
```

Arguments

model name of the model

Value

A character string containing the model script

KDramaData

Korean Drama Ratings

Description

Ratings of Korean dramas prodcast during different days of the week and didfferent producers

Usage

KDramaData

Format

A data frame with 101 observations on the following 5 variables.

Drama name of drama

Schedule indicator of what day the drama was broadcast

Producer indicator of the producer of the drama

Rating rating of the drama

Date date of rating

Source

AGB Nielsen Media Research Group

LaborParticipation

U.S. Women Labor Participation

Description

U.S. women labor participation and family income

Usage

LaborParticipation

Format

A data frame with 753 observations on the following 2 variables.

Participation labor participation of the wife

FamilyIncome family income exclusive of wife's income in \$1000

Source

University of Michigan Panel Study of Income Dynamics

Madison_can	<i>Frequency use of "can" for Federalist Papers</i>
-------------	---

Description

Frequency use of "can" for Federalist Papers written by James Madison

Usage

Madison_can

Format

A data frame with 49 observations on the following 6 variables.

Name name of Federalist paper

Total total number of words

word word that is counted

N frequency of the word

Rate fraction of words with that word

Authorship author of paper

Source

<http://www.gutenberg.org/ebooks/18>

many_normal_plots	<i>Graph of several normal curves</i>
-------------------	---------------------------------------

Description

Graph of several normal curves

Usage

```
many_normal_plots(list_normal_par)
```

Arguments

list_normal_par

list of vectors, where each vector is a mean and standard deviation for a normal distribution

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
list_normal_par <- list(c(100, 15),  
  c(110, 15), c(120, 15))  
many_normal_plots(list_normal_par)
```

many_spinner_plots *Graphs a collection of spinners*

Description

Graphs a collection of spinners

Usage

```
many_spinner_plots(list_regions)
```

Arguments

list_regions list of vectors of integer areas for the spins 1, 2, ...

Value

A ggplot2 object containing the spinner displays

Author(s)

Jim Albert

Examples

```
regions1 <- c(1, 1, 1)  
regions2 <- c(2, 1, 2, 1)  
many_spinner_plots(list(regions1, regions2))
```

marriage_counts	<i>Annual Marriage Counts in Italy</i>
-----------------	--

Description

Annual marriage counts per 1000 of the population in Italy from 1936 to 1951

Usage

marriage_counts

Format

A data frame with 16 observations on the following 2 variables.

Year year

Count count of marriages per 1000 people

Source

Unknown.

mcdonalds	<i>Nutritional data for McDonalds Sandwiches</i>
-----------	--

Description

Serving size and calories for a selection of sandwiches from McDonalds

Usage

mcdonalds

Format

A data frame with 11 observations on the following 3 variables.

Sandwich name of sandwich

Size serving size in grams

Calories calories of sandwich

Source

McDonalds restaurant

`metropolis`*Metropolis sampling of a continuous distribution*

Description

Implements Metropolis sampling for an arbitrary continuous probability distribution

Usage

```
metropolis(logpost, current, C, iter, ...)
```

Arguments

<code>logpost</code>	function definition of the log probability function
<code>current</code>	starting value of algorithm
<code>C</code>	half-width of proposal interval
<code>iter</code>	number of iterations
<code>...</code>	other inputs needed in logpost function

Value

<code>S</code>	vector of simulated values
<code>accept_rate</code>	acceptance rate of algorithm

Author(s)

Jim Albert

Examples

```
lpost <- function(theta, s){
  dnorm(s$ybar, theta, s$se, log = TRUE) +
  dcauchy(theta, s$loc, s$scale, log = TRUE)
}
s <- list(ybar = 20,
         se = 0.4,
         loc = 10,
         scale = 2)
post <- metropolis(lpost, 10, 20, 100, s)
```

movies2017	<i>Movies Sales Data</i>
------------	--------------------------

Description

Weekend and gross sales for a selection of movies released in 2017

Usage

movies2017

Format

A data frame with 10 observations on the following 3 variables.

Movie name of movie

Weekend opening weekend sales in millions of dollars

Gross gross sales in millions of dollars

Source

Internet Movie Database

nba_guards	<i>Basketball Shooting Data for Point Guards</i>
------------	--

Description

Field goal and free throw shooting data for a collection of great NBA point guards

Usage

nba_guards

Format

A data frame with 230 observations on the following 6 variables.

Player name of player

Age age of player

FG field goals

FGA field goal attempts

FT free throws

FTA free throw attempts

Source

Data collected from Basketball-Reference.com.

normal_area	<i>Displays Area Under a Normal Curve</i>
-------------	---

Description

Computes and Displays Area Under a Normal Curve

Usage

```
normal_area(lo, hi, normal_pars, Color = "orange")
```

Arguments

lo	lower bound of interval
hi	upper bound of interval
normal_pars	vector of mean and standard deviation of the normal curve
Color	color of shading in plot

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
lo <- 10
hi <- 20
normal_pars <- c(25, 10)
normal_area(lo, hi, normal_pars)
```

normal_draw	<i>Draws a Normal Curve</i>
-------------	-----------------------------

Description

Draws a Normal Curve

Usage

```
normal_draw(normal_pars, Color = "red")
```

Arguments

normal_pars vector of mean and standard deviation of the normal curve
Color color of line in plot

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
normal_pars <- c(2, 1)
normal_draw(normal_pars)
```

normal_interval	<i>Probability Interval for a Normal Curve</i>
-----------------	--

Description

Computes "equal-tails" probability interval for a normal curve

Usage

```
normal_interval(prob, normal_pars, Color = "orange")
```

Arguments

prob value of coverage probability
normal_pars vector of mean and standard deviation of the normal curve
Color color of shading in plot

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
normal_pars <- c(2, 0.5)
prob <- 0.5
normal_interval(prob, normal_pars)
```

normal_quantile	<i>Displays a Quantile of a Normal Curve</i>
-----------------	--

Description

Displays a Quantile of a Normal Curve

Usage

```
normal_quantile(prob, normal_pars, Color = "orange")
```

Arguments

prob	probability value of interest
normal_pars	vector of mean and standard deviation of the normal curve
Color	color of shading in plot

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
normal_pars <- c(100, 10)
prob <- 0.7
normal_quantile(prob, normal_pars)
```

normal_update	<i>Updates a Normal Prior with Normal Data</i>
---------------	--

Description

Finds the parameters of the normal posterior with normal data and a normal prior

Usage

```
normal_update(prior, data, teach=FALSE)
```

Arguments

prior	vector with components mean and sd of the normal prior
data	vector with components the sample mean and the standard error of the estimate
teach	logical variable indicating the form of the output

Value

If `teach = TRUE`, returns data frame that displays the mean, precision, and standard deviation for the prior, data, and posterior. If `teach = FALSE`, returns a vector with mean and standard deviation of the posterior.

Author(s)

Jim Albert

Examples

```
prior <- c(100, 10)
data <- c(110, 15)
normal_update(prior, data)
normal_update(prior, data, teach=TRUE)
```

olympic_butterfly

Winning Times in the 100 Meter Butterfly Race

Description

Winning times in seconds for the men's and women's 100m butterfly race for the Olympics from 1964 through 2016.

Usage

```
olympic_butterfly
```

Format

A data frame with 28 observations on the following 3 variables.

Year year of Olympics

Gender gender

Time winning time in seconds

Source

<https://www.olympic.org/swimming/>

prior_post_plot *Graphs prior and posterior probabilities*

Description

Graphs prior and posterior probabilities from a discrete Bayesian model

Usage

```
prior_post_plot(d, Color = "orange")
```

Arguments

d data frame where the first column are the model values, and columns named Prior and Posterior

Color fill color for the bars

Value

ggplot2 object containing the graphical display.

Author(s)

Jim Albert

Examples

```
d <- data.frame(p=c(.1, .3, .5, .7, .9),
                Prior=rep(1/5, 5))
y <- 5
n <- 10
d$Likelihood <- dbinom(y, prob=d$p, size=n)
d <- bayesian_crank(d)
prior_post_plot(d, "red")
```

prob_plot *Constructs a graph of a probability distribution*

Description

Constructs a graph of a discrete probability distribution

Usage

```
prob_plot(d, Color = "red", Size = 1.5)
```

Arguments

d	data frame where the first two columns are the variable and associated probabilities
Color	color of line in plot
Size	width of line in plot

Value

A ggplot2 object containing the plot display

Author(s)

Jim Albert

Examples

```
d <- data.frame(x=1:5,
                Probability=c(.1, .2, .3, .3, .1))
prob_plot(d)
```

ProfessorSalary	<i>Professor Salary Study</i>
-----------------	-------------------------------

Description

Study on inputs that impact a salary of a professor

Usage

```
ProfessorSalary
```

Format

A data frame with 397 observations on the following 7 variables.

subject subject id
rank professor rank
discipline A is theoretical and B is applied
yrs.since.phd number of years since receipt of doctorate
yrs.service number of years of service
sex Female or Male
salary nine-month salary in dollars

Source

Unknown.

pt100price

Prices of One Carat Diamonds

Description

Prices of a sample of one carat diamonds

Usage

pt100price

Format

A data frame with 25 observations on the following 2 variables.

diamond index of diamond

price price divided by 100

Source

Unknown.

pt99price

Prices of 0.99 Carat Diamonds

Description

Prices of a sample of 0.99 carat diamonds

Usage

pt99price

Format

A data frame with 23 observations on the following 2 variables.

diamond index of diamond

price price divided by 100

Source

Unknown.

pythag2018

Baseball Win-Loss Records

Description

Final standings of the MLB baseball teams in the 2018 season

Usage

pythag2018

Format

A data frame with 30 observations on the following 7 variables.

Team team abbreviation

League league abbreviation

W number of wins

L number of losses

Pct proportion of wins

R average runs scored

RA average runs allowed

Source

Lahman database

random_walk

Metropolis sampling of a discrete distribution

Description

Implements Metropolis sampling for an arbitrary discrete probability distribution

Usage

random_walk(pd, start, num_steps)

Arguments

pd function containing discrete probability function on the integers 1, 2, ...

start starting value of algorithm

num_steps number of iterations of algorithm

Value

A vector of simulated values

Author(s)

Jim Albert

Examples

```
# random walk through a binomial distribution
pd <- function(x){
  dbinom(x, size = 10, prob = 0.5)
}
start <- 4
num_steps <- 50
out <- random_walk(pd, start, num_steps)
```

ScoreData

Scores on Achievement Exam

Description

Scores on a 20-question T/F exam

Usage

ScoreData

Format

A data frame with 30 observations on the following 2 variables.

Person subject id

Score number correct in 20-question exam

Source

Data randomly generated.

sleeping_times	<i>Sleeping Times</i>
----------------	-----------------------

Description

Sample of sleeping times for a single night for a sample of college students

Usage

```
sleeping_times
```

Format

A data frame with 14 observations on the following single variable.

hours number of hours of sleep

Source

Personal collection

spinner_bayes	<i>Implements Bayes' rule for a spinner problem</i>
---------------	---

Description

Computes and plots the posterior distribution of spinners given a sequence of spins

Usage

```
spinner_bayes(list_regions,
              prior,
              data,
              plot=TRUE)
```

Arguments

<code>list_regions</code>	list of vectors of integer areas for the spins 1, 2, ...
<code>prior</code>	a vector containing the prior probabilities for the spinners
<code>data</code>	a vector containing the spin values where 1, 2, 3, ... are the possible spins
<code>plot</code>	if <code>plot=TRUE</code> , a comparative graph of the prior and posterior probabilities is displayed

Value

A data frame with variables Spinner, Prior, Likelihood, Product, and Posterior

Author(s)

Jim Albert

Examples

```
regions1 <- c(1, 1, 1)
regions2 <- c(2, 1, 2, 1)
data <- c(1, 1, 1, 2)
spinner_bayes(list(regions1, regions2),
              prior=c(0.5, 0.5),
              data)
```

spinner_data

Simulate random data from a spinner

Description

Simulate random data from a spinner

Usage

```
spinner_data(regions, nsim=1000)
```

Arguments

regions vector of integer values for the spins 1, 2, ...
nsim number of spins

Value

A vector of random spins from the spinner

Author(s)

Jim Albert

Examples

```
regions <- c(2, 1, 1, 2)
spinner_data(regions, nsim=20)
```

spinner_likelihoods *Computes likelihood matrix for many spinners*

Description

Computes likelihood matrix for many spinners

Usage

```
spinner_likelihoods(regions)
```

Arguments

regions list of vectors of integer areas for the spins 1, 2, ...

Value

A matrix where each row corresponds to the outcome probabilities for one spinner.

Author(s)

Jim Albert

Examples

```
sp1 <- c(2, 1, 1)
sp2 <- c(1, 1, 1, 1)
regions <- list(sp1, sp2)
spinner_likelihoods(regions)
```

spinner_plot *Constructs a spinner*

Description

Constructs a spinner with different regions

Usage

```
spinner_plot(probs, ...)
```

Arguments

probs vector of probabilities for the spins 1, 2, ...
... optional vector of values and title

Value

A ggplot2 object containing the spinner display

Author(s)

Jim Albert

Examples

```
probs <- rep(.2, 5)
spinner_plot(probs,
             values=c("A", "B", "C", "D", "E"),
             title="My Spinner")
# probs does not need to be normalized
spinner_plot(c(1, 2, 1, 2))
```

spinner_probs	<i>Display probability distribution for a spinner</i>
---------------	---

Description

Display probability distribution for a spinner

Usage

```
spinner_probs(regions)
```

Arguments

regions vector of positive values for the spins 1, 2, ...

Value

Dataframe with variables Region and Prob

Author(s)

Jim Albert

Examples

```
regions <- c(2, 1, 1, 2)
spinner_probs(regions)
```

`taxi_fares`*Taxi Fares*

Description

Sample of taxi fares from a particular city

Usage`taxi_fares`**Format**

A data frame with 20 observations on the following single variable.

fare taxi cab fare

Source

Personal collection

`tennis_serve`*Tennis Times to Serve*

Description

Data on time to serve for six professional tennis players

Usage`tennis_serve`**Format**

A data frame with 6 observations on the following 3 variables.

Player last name of player

n number of serves

ybar mean time to serve

Source

<https://github.com/JeffSackmann>

testing_prior	<i>Testing prior for two proportions</i>
---------------	--

Description

Constructs a discrete distribution for two proportions under a testing or uniform hypotheses

Usage

```
testing_prior(lo=.1, hi=.9, n_values=9,  
             pequal=0.5, uniform=FALSE)
```

Arguments

lo	minimum value of each proportion
hi	maximum value of each proportion
n_values	number of values of each proportion
pequal	probability of the equality of the two proportions
uniform	indicates if a uniform prior is desired

Value

matrix of probabilities where the rows and columns are labeled by the values of the proportions

Author(s)

Jim Albert

Examples

```
# testing prior where each proportion is  
# .1, .3, .5, .7, .9  
Prob <- testing_prior(.1, .9, 5)  
# uniform prior over same proportion values  
Prob <- testing_prior(.1, .9, 5, uniform=TRUE)
```

`trout20`*Mike Trout Statcast Data*

Description

Launch speed and distance traveled for a sample of balls hit by the baseball player Mike Trout

Usage`trout20`**Format**

A data frame with 25 observations on the following 2 variables.

launch_speed launch speed in mph

hit_distance_sc distance in feet

Source

Major League Baseball Advanced Media

`two_players_time_to_serve`*Times to Serve for Two Tennis Players*

Description

Measurements of time to serve serves of the tennis players Roger Federer and Rafael Nadal

Usage`two_players_time_to_serve`**Format**

A data frame with 100 observations on the following 2 variables.

Player last name of player

time time to serve in seconds

Source

<https://github.com/JeffSackmann>

two_p_summarize	<i>Summaries of a probability matrix</i>
-----------------	--

Description

Computes posterior of difference $P2 - P1$ of a probability matrix of two proportions

Usage

```
two_p_summarize(prob_matrix)
```

Arguments

prob_matrix	probability matrix where the rows and columns are labeled with the values of the proportions
-------------	--

Value

data frame with variables diff21 and Prob where $\text{diff21} = P2 - P1$

Author(s)

Jim Albert

Examples

```
# use uniform prior over values .2, .3, .4
prob_matrix <- testing_prior(.2, .4, 3, uniform=TRUE)
two_p_summarize(prob_matrix)
```

two_p_update	<i>Posterior updating of two proportions</i>
--------------	--

Description

Computes posterior distribution of two proportions with a discrete prior

Usage

```
two_p_update(prior, s1f1, s2f2)
```

Arguments

prior	prior probability matrix where the rows and columns are labeled with the values of the proportions
s1f1	number of successes and number of failures from first sample
s2f2	number of successes and number of failures from second sample

Value

posterior probability matrix

Author(s)

Jim Albert

Examples

```
prior <- testing_prior()
s1f1 <- c(3, 10)
s2f2 <- c(8, 20)
two_p_update(prior, s1f1, s2f2)
```

web_visits

Website tracking data

Description

Number of visits to a blog website for different weeks and days of the week

Usage

```
web_visits
```

Format

A data frame with 28 observations on the following 3 variables.

Week week number

Day day of the week

Count number of website visits

Source

Personal data collected from Wordpress.com

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