

Package ‘ProbBayes’

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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	<i>Displays Areas Under a Beta Curve</i>
-----------	--

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

Draw a Beta Curve

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	<i>Probability Interval for a Beta Curve</i>
---------------	--

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	<i>Plot of Two Beta Curves</i>
-----------------	--------------------------------

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	<i>Displays a Quantile of a Beta Curve</i>
---------------	--

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	<i>Text Statistics for Books</i>
------------	----------------------------------

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	<i>Buffalo snowfall data</i>
-------------	------------------------------

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

Centers title in a ggplot2 graphic

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

Expeditures of U.S. Households

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

Plot of Distribution of Two Proportions

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

Hypergeometric sampling density

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	<i>Computes likelihoods for spinner outcomes</i>
----------	--

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 *Frequency use of words for Federalist Papers*

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 *Fire Calls for Zip Code Areas*

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](https://www.kaggle.com)

football_field_goals *Football Field Goals Dataset*

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	<i>Gibbs sampling of the beta-binomial distribution</i>
---------------	---

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	<i>Gibbs sampling of a bivariate discrete distribution</i>
----------------	--

Description

Implements Gibbs sampling for an arbitrary bivariate discrete distribution

Usage

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

Arguments

p matrix defining the probability distribution
i starting row of the matrix
iter 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	<i>House price data</i>
--------------	-------------------------

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

Increases font size of text

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

JAGS Script for Common Models

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 *Frequency use of "can" for Federalist Papers*

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 *Graph of several normal curves*

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`

Annual Marriage Counts in Italy

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	<i>Metropolis sampling of a continuous distribution</i>
------------	---

Description

Implements Metropolis sampling for an arbitrary continuous probability distribution

Usage

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

Arguments

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

Value

`S` vector of simulated values
`accept_rate` 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

Movies Sales Data

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`*Basketball Shooting Data for Point Guards*

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`*Displays Area Under a Normal Curve*

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

Draws a Normal Curve

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

Updates a Normal Prior with Normal Data

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	<i>Winning Times in the 100 Meter Butterfly Race</i>
-------------------	--

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	<i>Graphs prior and posterior probabilities</i>
-----------------	---

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 *Professor Salary Study*

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	<i>Metropolis sampling of a discrete distribution</i>
-------------	---

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	<i>Scores on Achievement Exam</i>
-----------	-----------------------------------

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

list_regions	list of vectors of integer areas for the spins 1, 2, ...
prior	a vector containing the prior probabilities for the spinners
data	a vector containing the spin values where 1, 2, 3, ... are the possible spins
plot	if plot=TRUE, 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	<i>Simulate random data from a spinner</i>
--------------	--

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

Display probability distribution for a spinner

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	<i>Taxi Fares</i>
------------	-------------------

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	<i>Tennis Times to Serve</i>
--------------	------------------------------

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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