Package 'holi'

August 25, 2024

Title Higher Order Likelihood Inference Web Applications

Version 0.1.1

Description Higher order likelihood inference is a promising approach for
analyzing small sample size data. The 'holi' package provides web applications
for higher order likelihood inference. It currently supports linear, logistic,
and Poisson generalized linear models through the rstar_glm() function, based
on Pierce and Bellio (2017) <doi:10.1111/insr.12232> and 'likelihoodAsy'.
The package offers two main features: LA_rstar(), which launches an interactive
'shiny' application allowing users to fit models with rstar_glm() through their
web browser, and sim_rstar_glm_pgsql(), which streamlines the process of
launching a web-based 'shiny' simulation application that saves results to a
user-created 'PostgreSQL' database.

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Encoding UTF-8

RoxygenNote 7.3.2

URL https://github.com/mightymetrika/holi

BugReports https://github.com/mightymetrika/holi/issues

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

Imports DT, ggplot2, likelihoodAsy, MASS, pool, RPostgres, shiny,
shinythemes, sn

NeedsCompilation no

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Repository CRAN

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Contents

LA_rstar	*Launch Shiny App for likelihoodAsy rstar Analysis*

Description

This function launches a Shiny application that facilitates the setup and execution of likelihoodAsy rstar analysis. The app allows users to upload a dataset, specify a model and parameters of interest, and perform the analysis with the option to compute confidence intervals for r* statistics.

Usage

```
LA_rstar()
```

Value

A Shiny app object that can be run locally.

References

Pierce, D. A., & Bellio, R. (2017). Modern Likelihood-Frequentist Inference. International Statistical Review / Revue Internationale de Statistique, 85(3), 519–541. doi:10.1111/insr.12232

Bellio R, Pierce D (2020). likelihoodAsy: Functions for Likelihood Asymptotics. R package version 0.51, https://CRAN.R-project.org/package=likelihoodAsy.

Examples

```
if (interactive()) {
  LA_rstar()
}
```

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rstar_glm   *Compute r* Statistics for Generalized Linear Models*

Description

The `rstar_glm` function computes r* statistics for hypothesis testing on coefficients of interest in generalized linear models (GLMs). It supports logistic, linear, and Poisson regression models. For logistic models, the outcome must be binary.

Usage

```
rstar_glm(
  .formula,
  .data,
  .model = c("logistic", "linear", "poisson"),
  .psidesc = "Coefficient of Interest",
  .psival = 0,
  .fpsi = 2,
  .rstar.ci = FALSE,
  trace = FALSE,
  ...
)

## S3 method for class 'logistic'
rstar_glm(
  .formula,
  .data,
  .model = c("logistic", "linear", "poisson"),
  .psidesc = "Coefficient of Interest",
  .psival = 0,
  .fpsi = 2,
  .rstar.ci = FALSE,
  trace = FALSE,
  ...
)

## S3 method for class 'linear'
rstar_glm(
  .formula,
  .data,
  .model = c("logistic", "linear", "poisson"),
  .psidesc = "Coefficient of Interest",
  .psival = 0,
  .fpsi = 2,
  .rstar.ci = FALSE,
  trace = FALSE,
  ...
```

```
)

## S3 method for class 'poisson'
rstar_glm(
  .formula,
  .data,
  .model = c("logistic", "linear", "poisson"),
  .psidesc = "Coefficient of Interest",
  .psival = 0,
  .fpsi = 2,
  .rstar.ci = FALSE,
  trace = FALSE,
  ...
)

## Default S3 method:
rstar_glm(
  .formula,
  .data,
  .model = c("logistic", "linear", "poisson"),
  .psidesc = "Coefficient of Interest",
  .psival = 0,
  .fpsi = 2,
  .rstar.ci = FALSE,
  trace = FALSE,
  ...
)
```

Arguments

`.formula`	A formula specifying the model.
`.data`	A data frame containing the variables in the model.
`.model`	The type of GLM model: "logistic", "linear", or "poisson".
`.psidesc`	A description of the parameter of interest.
`.psival`	The value of the parameter of interest under the null hypothesis.
`.fpsi`	The index of the parameter of interest.
`.rstar.ci`	Logical; if TRUE, compute confidence intervals for r*.
`trace`	Logical; if TRUE, print information about computation. (Default is FALSE)
`...`	Additional arguments passed to the likelihoodAsy functions.

Value

A list with the object returned from likelihoodAsy::rstar (`rs`), the object returned from likelihoodAsy::rstar.ci (`rs_ci`), and the object returned from stats::glm (`fit_glm`).

References

Pierce, D. A., & Bellio, R. (2017). Modern Likelihood-Frequentist Inference. *International Statistical Review / Revue Internationale de Statistique*, 85(3), 519–541. doi:10.1111/insr.12232

Bellio R, Pierce D (2020). likelihoodAsy: Functions for Likelihood Asymptotics. R package version 0.51, https://CRAN.R-project.org/package=likelihoodAsy.

Examples

```
# Logistic model
rstar_glm(law ~ DriversKilled + VanKilled + drivers + kms,
          .data = Seatbelts,
          .model = "logistic") |> suppressWarnings()

# Poisson model
rstar_glm(count ~ spray,
          .data = InsectSprays,
          .model = "poisson") |> suppressWarnings()

# Linear model
rstar_glm(mpg ~ wt + hp,
          .data = mtcars,
          .model = "linear") |> suppressWarnings()
```

---

run_sim_rstar_glm   *Run Multiple Iterations of Simulation and Summarize Results*

Description

This function runs multiple iterations of simulation for the `sim_rstar_glm` function and summarizes the results, including rejection rates, bias, empirical standard error, mean squared error, and root mean squared error.

Usage

```
run_sim_rstar_glm(
  n_sims,
  alpha_level = 0.05,
  n_main,
  n_covariates,
  true_coef_main,
  n_control = NULL,
  true_coef_control = NULL,
  treatment_effect = NULL,
  model = c("logistic", "linear", "poisson"),
  skewness_main = NULL,
  skewness_control = NULL,
```

```
    Sigma_main = NULL,
    Sigma_control = NULL,
    ...
)
```

Arguments

`n_sims`	Number of simulations to run.
`alpha_level`	Significance level for hypothesis tests.
`n_main`	Number of observations in the main group.
`n_covariates`	Number of covariates.
`true_coef_main`	True coefficients for the main group.
`n_control`	Number of observations in the control group.
`true_coef_control`	
	True coefficients for the control group.
`treatment_effect`	
	Treatment effect size.
`model`	Type of model: "logistic", "linear", or "poisson".
`skewness_main`	Skewness for the main group covariates.
`skewness_control`	
	Skewness for the control group covariates.
`Sigma_main`	Covariance matrix for the main group covariates.
`Sigma_control`	Covariance matrix for the control group covariates.
`...`	Additional arguments passed to `sim_rstar_glm`.

Value

A list with the results of each simulation and a summary of the results.

References

Pierce, D. A., & Bellio, R. (2017). Modern Likelihood-Frequentist Inference. International Statistical Review / Revue Internationale de Statistique, 85(3), 519–541. doi:10.1111/insr.12232

Bellio R, Pierce D (2020). likelihoodAsy: Functions for Likelihood Asymptotics. R package version 0.51, https://CRAN.R-project.org/package=likelihoodAsy.

Examples

```
sim_summary <- run_sim_rstar_glm(
  n_sims = 2, alpha_level = 0.05,
  n_main = 100, n_covariates = 2, true_coef_main = c(0.5, -0.3),
  n_control = 100, true_coef_control = c(0.2, -0.1),
  treatment_effect = 1, model = "linear"
) |> suppressWarnings()
```

---

sim_rstar_glm *Simulate Data and Fit GLM and r* Models*

Description

This function generates simulated data for main and control groups, fits a generalized linear model (GLM) and an r* model, and returns the results.

Usage

```
sim_rstar_glm(
  n_main,
  n_covariates,
  true_coef_main,
  n_control = NULL,
  true_coef_control = NULL,
  treatment_effect = NULL,
  model = c("logistic", "linear", "poisson"),
  skewness_main = NULL,
  skewness_control = NULL,
  Sigma_main = NULL,
  Sigma_control = NULL,
  ...
)
```

Arguments

n_main	Number of observations in the main group.
n_covariates	Number of covariates.
true_coef_main	True coefficients for the main group.
n_control	Number of observations in the control group.
true_coef_control	
	True coefficients for the control group.
treatment_effect	
	Treatment effect size.
model	Type of model: "logistic", "linear", or "poisson".
skewness_main	Skewness for the main group covariates.
skewness_control	
	Skewness for the control group covariates.
Sigma_main	Covariance matrix for the main group covariates.
Sigma_control	Covariance matrix for the control group covariates.
...	Additional arguments passed to rstar_glm.

Value

A list with fitted GLM and r* models, and the simulated data.

References

Pierce, D. A., & Bellio, R. (2017). Modern Likelihood-Frequentist Inference. International Statistical Review / Revue Internationale de Statistique, 85(3), 519–541. doi:10.1111/insr.12232

Bellio R, Pierce D (2020). likelihoodAsy: Functions for Likelihood Asymptotics. R package version 0.51, https://CRAN.R-project.org/package=likelihoodAsy.

Examples

```
sim_result <- sim_rstar_glm(
  n_main = 100, n_covariates = 2, true_coef_main = c(0.5, -0.3),
  n_control = 100, true_coef_control = c(0.2, -0.1),
  treatment_effect = 0.5, model = "logistic"
) |> suppressWarnings()
```

---

sim_rstar_glm_pgsql	*Shiny App for Running r* GLM Simulations with PostgreSQL Integration*

Description

This function launches a Shiny application for setting up and running simulations based on the rstar_glm function. The app allows users to input parameters for the simulation, run the simulation, view results, and save results to a PostgreSQL database.

Usage

```
sim_rstar_glm_pgsql(dbname, datatable, host, port, user, password)
```

Arguments

dbname	The name of the PostgreSQL database.
datatable	The name of the table in the PostgreSQL database to save the results.
host	The host of the PostgreSQL database.
port	The port of the PostgreSQL database.
user	The username for accessing the PostgreSQL database.
password	The password for accessing the PostgreSQL database.

Value

A Shiny app object that can be run locally.

References

Pierce, D. A., & Bellio, R. (2017). Modern Likelihood-Frequentist Inference. International Statistical Review / Revue Internationale de Statistique, 85(3), 519–541. doi:10.1111/insr.12232

Bellio R, Pierce D (2020). likelihoodAsy: Functions for Likelihood Asymptotics. R package version 0.51, https://CRAN.R-project.org/package=likelihoodAsy.

Examples

```
if (interactive()) {
  sim_rstar_glm_pgsql(
    dbname = "mydb",
    datatable = "simulation_results",
    host = "localhost",
    port = 5432,
    user = "myuser",
    password = "mypassword"
  )
}
```

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