

Package ‘Elja’

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Type Package

Title Linear, Logistic and Generalized Linear Models Regressions for the EnvWAS/EWAS Approach

Version 1.0.1

Description Tool for Environment-Wide Association Studies (EnvWAS / EWAS) which are repeated analysis. It includes three functions. One function for linear regression, a second for logistic regression and a last one for generalized linear models.

Depends R (>= 4.3)

Imports stats, devtools, dplyr, ggplot2, MASS

Suggests knitr, rmarkdown, mlbench (>= 2.1-11)

License GPL (>= 3)

URL <https://github.com/EHMarwan/Elja>

BugReports <https://github.com/EHMarwan/Elja/issues>

VignetteBuilder knitr

Encoding UTF-8

Config/roxygen2/version 8.1.0

NeedsCompilation no

Author Marwan El Homsy [aut, cre, cph] (ORCID:
<<https://orcid.org/0000-0002-5782-6757>>, affiliation: Desbrest
Institute of Epidemiology and Public Health, Univ Montpellier,
INSERM, Montpellier, France.),
Isabella Annesi-Maesano [ctb, ths, fnd] (ORCID:
<<https://orcid.org/0000-0002-6340-9300>>, affiliation1: Desbrest
Institute of Epidemiology and Public Health, Univ Montpellier,
INSERM, Montpellier, France., affiliation2: Department of Allergic
and Respiratory Diseases, Montpellier University Hospital,
Montpellier.)

Maintainer Marwan El Homsy <marwan_eh@outlook.fr>

Repository CRAN

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ELJAglm	<i>Generalized Linear Models regression for EnvWAS/EWAS analysis</i>
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Description

A tool for Environment-Wide Association Studies (EnvWAS / EWAS) which are repeated analysis. This function is espacially for generalized linear models 'glm' and allows the addition of adjustment variables.

Usage

```
ELJAglm(
  var,
  var_adjust = NULL,
  family = binomial(link = "logit"),
  data,
  manplot = TRUE,
  nbvalmanplot = 100,
  Bonferroni = FALSE,
  FDR = FALSE,
  manplotsign = FALSE
)
```

Arguments

var	A categorical and binary variable. It is generally your outcome.
var_adjust	A vector containing the names of the fixed adjustment variables for all the models.
family	The family and the link use for the glm function.
data	A dataframe containing all the variables needed for the analysis.
manplot	Generate a Manhattan plot of the results of the analysis.
nbvalmanplot	The number of variables to include in each Manhattan plot.
Bonferroni	Add a dashed bar to the Manhattan plot showing the Bonferroni significance threshold.
FDR	Add a dashed bar to the Manhattan plot showing the False Discovery Rate (Benjamini-Hochberg method) significance threshold. NA if all p-values > FDR corrected p-values.
manplotsign	Generates a Manhattan plot with only significant results (p<0.05).

Value

A Dataframe with results for each variable of the model.

References

Dunn OJ. Multiple Comparisons Among Means. *Journal of the American Statistical Association*. 1961;56(293):52-64. Benjamini Y, Hochberg Y. Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing. *Journal of the Royal Statistical Society: Series B (Methodological)*. 1995;57(1):289-300. Leisch F, Dimitriadou E. mlbench: Machine Learning Benchmark Problems. R package version 2.1-11; 2025. Available from: <https://CRAN.R-project.org/package=mlbench>

Examples

```
### Loading the synthetic diabetes dataset contained in the mlbench package

library(mlbench)
data(SynthDiabetes)

### Using ELJAlinear to perform EWAS analysis

ELJAglm(var = 'diabetes',data = SynthDiabetes,
family = binomial(link = "logit"), manplot = TRUE, Bonferroni = TRUE,
FDR = TRUE, nbvalmanplot = 30, manplotsign = FALSE)
results
```

ELJAlinear

Linear regression for EnvWAS/EWAS analysis

Description

A tool for Environment-Wide Association Studies (EnvWAS / EWAS) namely repeated analyses allowing to estimate the relationships between several environmental factors and a health events. This function is especially for linear regressions and allows the addition of adjustment variables.

Usage

```
ELJAlinear(
  var,
  var_adjust = NULL,
  data,
  manplot = TRUE,
  nbvalmanplot = 100,
  Bonferroni = FALSE,
  FDR = FALSE,
  manplotsign = FALSE
)
```

Arguments

<code>var</code>	A categorical and binary variable. It is generally your outcome.
<code>var_adjust</code>	A vector containing the names of the fixed adjustment variables for all the models.
<code>data</code>	A dataframe containing all the variables needed for the analysis.
<code>manplot</code>	Generate a Manhattan plot of the results of the analysis.
<code>nbvalmanplot</code>	The number of variables to include in each Manhattan plot.
<code>Bonferroni</code>	Add a dashed bar to the Manhattan plot showing the Bonferroni significance level.
<code>FDR</code>	Add a dashed bar to the Manhattan plot showing the False Discovery Rate (Benjamini-Hochberg method) significance threshold. NA if all p-values > FDR corrected p-values.
<code>manplotsign</code>	Generates a Manhattan plot with only significant results ($p < 0.05$).

Value

A Dataframe with results for each variable of the model.

References

Dunn OJ. Multiple Comparisons Among Means. *Journal of the American Statistical Association*. 1961;56(293):52-64. Benjamini Y, Hochberg Y. Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing. *Journal of the Royal Statistical Society: Series B (Methodological)*. 1995;57(1):289-300. Leisch F, Dimitriadou E. *mlbench: Machine Learning Benchmark Problems*. R package version 2.1-11; 2025. Available from: <https://CRAN.R-project.org/package=mlbench>

Examples

```
### Loading the synthetic diabetes dataset contained in the mlbench package

library(mlbench)
data(SynthDiabetes)

### Using ELJAlinear to perform EWAS analysis

ELJAlinear(var = 'pregnant', data = SynthDiabetes, manplot = TRUE,
Bonferroni = TRUE, FDR = TRUE, nbvalmanplot = 30, manplotsign = FALSE)
results
```

Description

A tool for Environment-Wide Association Studies (EnvWAS / EWAS) which are repeated analysis. This function is especially for logistic regression based on the `glm` function with a binomial family with a logit link and allows the addition of adjustment variables.

Usage

```
ELJAl Logistic(  
  var,  
  var_adjust = NULL,  
  data,  
  manplot = TRUE,  
  nbvalmanplot = 100,  
  Bonferroni = FALSE,  
  FDR = FALSE,  
  manplotsign = FALSE  
)
```

Arguments

<code>var</code>	A categorical and binary variable. It is generally your outcome.
<code>var_adjust</code>	A vector containing the names of the fixed adjustment variables for all the models.
<code>data</code>	A dataframe containing all the variables needed for the analysis.
<code>manplot</code>	Generate a Manhattan plot of the results of the analysis.
<code>nbvalmanplot</code>	The number of variables to include in each Manhattan plot.
<code>Bonferroni</code>	Add a dashed bar to the Manhattan plot showing the Bonferroni significance level.
<code>FDR</code>	Add a dashed bar to the Manhattan plot showing the False Discovery Rate (Benjamini-Hochberg method) significance threshold. NA if all p-values > FDR corrected p-values.
<code>manplotsign</code>	Generates a Manhattan plot with only significant results ($p < 0.05$).

Value

A Dataframe with results for each variable of the model.

References

Dunn OJ. Multiple Comparisons Among Means. *Journal of the American Statistical Association*. 1961;56(293):52-64. Benjamini Y, Hochberg Y. Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing. *Journal of the Royal Statistical Society: Series B (Methodological)*. 1995;57(1):289-300. Leisch F, Dimitriadou E. mlbench: Machine Learning Benchmark Problems. R package version 2.1-11; 2025. Available from: <https://CRAN.R-project.org/package=mlbench>

Examples

```
### Loading the synthetic diabetes dataset contained in the mlbench package

library(mlbench)
data(SynthDiabetes)

### Using ELJAl linear to perform EWAS analysis

ELJAl Logistic(var = 'diabetes', data = SynthDiabetes, manplot = TRUE,
Bonferroni = TRUE, FDR = TRUE, nbvalmanplot = 30, manplotsign = FALSE)
results
```

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