Package ‘RcppEnsmallen’

February 19, 2022

Title  Header-Only C++ Mathematical Optimization Library for
       'Armadillo'

Version  0.2.18.2.1

Description  'Ensmallen' is a templated C++ mathematical optimization library
              (by the 'MLPACK' team) that provides a simple set of abstractions for writing an
              objective function to optimize. Provided within are various standard and
              cutting-edge optimizers that include full-batch gradient descent techniques,
              small-batch techniques, gradient-free optimizers, and constrained optimization.
              The 'RcppEnsmallen' package includes the header files from the 'Ensmallen' library
              and pairs the appropriate header files from 'armadillo' through the
              'RcppArmadillo' package. Therefore, users do not need to install 'Ensmallen' nor
              'Armadillo' to use 'RcppEnsmallen'. Note that 'Ensmallen' is licensed under
              3-Clause BSD, 'Armadillo' starting from 7.800.0 is licensed under Apache License 2,
              'RcppArmadillo' (the 'Rcpp' bindings/bridge to 'Armadillo') is licensed under
              the GNU GPL version 2 or later. Thus, 'RcppEnsmallen' is also licensed under
              similar terms. Note that 'Ensmallen' requires a compiler that supports
              'C++11' and 'Armadillo' 9.800 or later.

Depends  R (>= 3.3.0)

License  GPL (>= 2)

URL  https://github.com/coatless-rpkg/rcppensmallen,

BugReports  https://github.com/coatless-rpkg/rcppensmallen/issues

Encoding  UTF-8

LinkingTo  Rcpp, RcppArmadillo (>= 0.9.800.0.0)

Imports  Rcpp

RoxygenNote  7.1.2

SystemRequirements  C++11

Suggests  knitr, rmarkdown

VignetteBuilder  knitr

NeedsCompilation  yes
RcppEnsmallen-package

Author James Joseph Balamuta [aut, cre, cph]
(https://orcid.org/0000-0003-2826-8458).
Dirk Eddelbuettel [aut, cph] (https://orcid.org/0000-0001-6419-907X)

Maintainer James Joseph Balamuta <balamut2@illinois.edu>

Repository CRAN

Date/Publication 2022-02-19 12:10:15 UTC

R topics documented:

RcppEnsmallen-package .................................................. 2
lin_reg_lbfgs .............................................................. 3

Index 5

RcppEnsmallen-package RcppEnsmallen: Header-Only C++ Mathematical Optimization Library for 'Armadillo'

Description

'Ensmallen' is a templated C++ mathematical optimization library (by the 'MLPACK' team) that provides a simple set of abstractions for writing an objective function to optimize. Provided within are various standard and cutting-edge optimizers that include full-batch gradient descent techniques, small-batch techniques, gradient-free optimizers, and constrained optimization. The 'RcppEnsmallen' package includes the header files from the 'Ensmallen' library and pairs the appropriate header files from 'armadillo' through the 'RcppArmadillo' package. Therefore, users do not need to install 'Ensmallen' nor 'Armadillo' to use 'RcppEnsmallen'. Note that 'Ensmallen' is licensed under 3-Clause BSD, 'Armadillo' starting from 7.800.0 is licensed under Apache License 2, 'RcppArmadillo' (the 'Rcpp' bindings/bridge to 'Armadillo') is licensed under the GNU GPL version 2 or later. Thus, 'RcppEnsmallen' is also licensed under similar terms. Note that 'Ensmallen' requires a compiler that supports 'C++11' and 'Armadillo' 9.800 or later.

Author(s)

Maintainer: James Joseph Balamuta <balamut2@illinois.edu> (ORCID) [copyright holder]

Authors:

- Dirk Eddelbuettel <edd@debian.org> (ORCID) [copyright holder]

See Also

Useful links:

- https://github.com/coatless-rpkg/rcppensmallen
- https://github.com/mlpack/ensmallen
- http://ensmallen.org/
- Report bugs at https://github.com/coatless-rpkg/rcppensmallen/issues
lin_reg_lbfgs

Linear Regression with L-BFGS

Description
Solves the Linear Regression’s Residual Sum of Squares using the L-BFGS optimizer.

Usage
lin_reg_lbfgs(X, y)

Arguments
- X: A matrix that is the Design Matrix for the regression problem.
- y: A vector containing the response values.

Details
Consider the Residual Sum of Squares, also known as RSS, defined as:

\[ RSS(\beta) = (y - X\beta)^T(y - X\beta) \]

The objective function is defined as:

\[ f(\beta) = (y - X\beta)^2 \]

The gradient is defined as:

\[ \frac{\partial RSS}{\partial \beta} = -2X^T(y - X\beta) \]

Value
The estimated \( \beta \) parameter values for the linear regression.

Examples
# Number of Points
n = 1000

# Select beta parameters
beta = c(-2, 1.5, 3, 8.2, 6.6)

# Number of Predictors (including intercept)
p = length(beta)

# Generate predictors from a normal distribution
X_i = matrix(rnorm(n), ncol = p - 1)

# Add an intercept
X = cbind(1, X_i)

# Generate y values
y = X%*%beta + rnorm(n / (p - 1))

# Run optimization with lbfgs
theta_hat = lin_reg_lbfgs(X, y)

# Verify parameters were recovered
cbind(actual = beta, estimated = theta_hat)
Index

lin_reg_lbfgs, 3

RcppEnsmallen (RcppEnsmallen-package), 2
RcppEnsmallen-package, 2