

Package ‘mlrnrs’

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Title R6-Based ML Learners for 'mlexperiments'

Version 0.0.6

Description Enhances 'mlexperiments'

<<https://CRAN.R-project.org/package=mlexperiments>> with additional machine learning ('ML') learners. The package provides R6-based learners for the following algorithms: 'glmnet' <<https://CRAN.R-project.org/package=glmnet>>, 'ranger' <<https://CRAN.R-project.org/package=ranger>>, 'xgboost' <<https://CRAN.R-project.org/package=xgboost>>, and 'lightgbm' <<https://CRAN.R-project.org/package=lightgbm>>. These can be used directly with the 'mlexperiments' R package.

License GPL (>= 3)

URL <https://github.com/kapsner/mlrnrs>

BugReports <https://github.com/kapsner/mlrnrs/issues>

Depends R (>= 4.1.0)

Imports data.table, kdry, mlexperiments (>= 0.0.6), R6, stats

Suggests glmnet, lightgbm (>= 4.0.0), lintr, measures, mlbench, ParBayesianOptimization, quarto, ranger, splitTools, testthat (>= 3.0.1), xgboost

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Repository CRAN

Contents

LearnerGlmnet	2
LearnerLightgbm	4
LearnerRanger	7
LearnerXgboost	9

Index	12
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LearnerGlmnet	<i>R6 Class to construct a Glmnet learner</i>
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Description

The LearnerGlmnet class is the interface to the glmnet R package for use with the mlexperiments package.

Details

Optimization metric: Can be used with

- [mlexperiments::MLTuneParameters](#)
- [mlexperiments::MLCrossValidation](#)
- [mlexperiments::MLNestedCV](#)

Super class

[mlexperiments::MLLearnerBase](#) -> LearnerGlmnet

Methods

Public methods:

- [LearnerGlmnet\\$new\(\)](#)
- [LearnerGlmnet\\$clone\(\)](#)

Method `new()`: Create a new LearnerGlmnet object.

Usage:

```
LearnerGlmnet$new(metric_optimization_higher_better)
```

Arguments:

`metric_optimization_higher_better` A logical. Defines the direction of the optimization metric used throughout the hyperparameter optimization.

Returns: A new LearnerGlmnet R6 object.

Examples:

```
LearnerGlmnet$new(metric_optimization_higher_better = FALSE)
```

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

```
LearnerGlmnet$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

See Also

[glmnet::glmnet\(\)](#), [glmnet::cv.glmnet\(\)](#)

Examples

```
# binary classification

library(mlbench)
data("PimaIndiansDiabetes2")
dataset <- PimaIndiansDiabetes2 |>
  data.table::as.data.table() |>
  na.omit()

seed <- 123
feature_cols <- colnames(dataset)[1:8]

train_x <- model.matrix(
  ~ -1 + .,
  dataset[, .SD, .SDcols = feature_cols]
)
train_y <- as.integer(dataset[, get("diabetes")]) - 1L

fold_list <- splitTools::create_folds(
  y = train_y,
  k = 3,
  type = "stratified",
  seed = seed
)
glmnet_cv <- mlexperiments::MLCrossValidation$new(
  learner = mllnrns::LearnerGlmnet$new(
    metric_optimization_higher_better = FALSE
  ),
  fold_list = fold_list,
  ncores = 2,
  seed = 123
)
glmnet_cv$learner_args <- list(
  alpha = 1,
  lambda = 0.1,
  family = "binomial",
```

```

    type.measure = "class",
    standardize = TRUE
  )
  glmnet_cv$predict_args <- list(type = "response")
  glmnet_cv$performance_metric_args <- list(positive = "1", negative = "0")
  glmnet_cv$performance_metric <- mlexperiments::metric("AUC")

  # set data
  glmnet_cv$set_data(
    x = train_x,
    y = train_y
  )

  glmnet_cv$execute()

  ## -----
  ## Method `LearnerGlmnet$new`
  ## -----

  LearnerGlmnet$new(metric_optimization_higher_better = FALSE)

```

LearnerLightgbm

R6 Class to construct a LightGBM learner

Description

The `LearnerLightgbm` class is the interface to the `lightgbm` R package for use with the `mlexperiments` package.

Details

Optimization metric: needs to be specified with the learner parameter `metric`. The following options can be set via `options()`:

- `"mlexperiments.optim.lgb.nrounds"` (default: 5000L)
- `"mlexperiments.optim.lgb.early_stopping_rounds"` (default: 500L)
- `"mlexperiments.lgb.print_every_n"` (default: 50L)
- `"mlexperiments.lgb.verbose"` (default: -1L)

`LearnerLightgbm` can be used with

- [mlexperiments::MLTuneParameters](#)
- [mlexperiments::MLCrossValidation](#)
- [mlexperiments::MLNestedCV](#)

Super class

[mlexperiments::MLLearnerBase](#) -> `LearnerLightgbm`

Methods

Public methods:

- [LearnerLightgbm\\$new\(\)](#)
- [LearnerLightgbm\\$clone\(\)](#)

Method `new()`: Create a new `LearnerLightgbm` object.

Usage:

```
LearnerLightgbm$new(metric_optimization_higher_better)
```

Arguments:

`metric_optimization_higher_better` A logical. Defines the direction of the optimization metric used throughout the hyperparameter optimization.

Returns: A new `LearnerLightgbm` R6 object.

Examples:

```
LearnerLightgbm$new(metric_optimization_higher_better = FALSE)
```

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

```
LearnerLightgbm$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

See Also

[lightgbm::lgb.train\(\)](#), [lightgbm::lgb.cv\(\)](#)

Examples

```
# binary classification

library(mlbench)
data("PimaIndiansDiabetes2")
dataset <- PimaIndiansDiabetes2 |>
  data.table::as.data.table() |>
  na.omit()

seed <- 123
feature_cols <- colnames(dataset)[1:8]

param_list_lightgbm <- expand.grid(
  bagging_fraction = seq(0.6, 1, .2),
  feature_fraction = seq(0.6, 1, .2),
  min_data_in_leaf = seq(10, 50, 10),
  learning_rate = seq(0.1, 0.2, 0.1),
  num_leaves = seq(10, 50, 10),
  max_depth = -1L
)
```

```

train_x <- model.matrix(
  ~ -1 + .,
  dataset[, .SD, .SDcols = feature_cols]
)
train_y <- as.integer(dataset[, get("diabetes")]) - 1L

fold_list <- splitTools::create_folds(
  y = train_y,
  k = 3,
  type = "stratified",
  seed = seed
)
lightgbm_cv <- mlexperiments::MLCrossValidation$new(
  learner = mllrnrs::LearnerLightgbm$new(
    metric_optimization_higher_better = FALSE
  ),
  fold_list = fold_list,
  ncores = 2,
  seed = 123
)
lightgbm_cv$learner_args <- c(
  as.list(
    data.table::data.table(
      param_list_lightgbm[37, ],
      stringsAsFactors = FALSE
    ),
  ),
  list(
    objective = "binary",
    metric = "binary_logloss"
  ),
  nrounds = 45L
)
lightgbm_cv$performance_metric_args <- list(positive = "1", negative = "0")
lightgbm_cv$performance_metric <- mlexperiments::metric("AUC")

# set data
lightgbm_cv$set_data(
  x = train_x,
  y = train_y
)

lightgbm_cv$execute()

## -----
## Method `LearnerLightgbm$new`
## -----

LearnerLightgbm$new(metric_optimization_higher_better = FALSE)

```

LearnerRanger

R6 Class to construct a Ranger learner

Description

The LearnerRanger class is the interface to the ranger R package for use with the `mlexperiments` package.

Details

Optimization metric:

- classification: classification error rate
- regression: mean squared error Can be used with
- [mlexperiments::MLTuneParameters](#)
- [mlexperiments::MLCrossValidation](#)
- [mlexperiments::MLNestedCV](#)

Super class

[mlexperiments::MLLearnerBase](#) -> LearnerRanger

Methods

Public methods:

- [LearnerRanger\\$new\(\)](#)
- [LearnerRanger\\$clone\(\)](#)

Method `new()`: Create a new LearnerRanger object.

Usage:

`LearnerRanger$new()`

Returns: A new LearnerRanger R6 object.

Examples:

`LearnerRanger$new()`

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

`LearnerRanger$clone(deep = FALSE)`

Arguments:

`deep` Whether to make a deep clone.

See Also

[ranger::ranger\(\)](#)

Examples

```

# binary classification

library(mlbench)
data("PimaIndiansDiabetes2")
dataset <- PimaIndiansDiabetes2 |>
  data.table::as.data.table() |>
  na.omit()

seed <- 123
feature_cols <- colnames(dataset)[1:8]

param_list_ranger <- expand.grid(
  num.trees = seq(500, 1000, 500),
  mtry = seq(2, 6, 2),
  min.node.size = seq(1, 9, 4),
  max.depth = seq(1, 9, 4),
  sample.fraction = seq(0.5, 0.8, 0.3)
)

train_x <- model.matrix(
  ~ -1 + .,
  dataset[, .SD, .SDcols = feature_cols]
)
train_y <- as.integer(dataset[, get("diabetes")]) - 1L

fold_list <- splitTools::create_folds(
  y = train_y,
  k = 3,
  type = "stratified",
  seed = seed
)

ranger_cv <- mlexperiments::MLCrossValidation$new(
  learner = mllrnrs::LearnerRanger$new(),
  fold_list = fold_list,
  ncores = 2,
  seed = 123
)
ranger_cv$learner_args <- c(
  as.list(
    data.table::data.table(
      param_list_ranger[37, ],
      stringsAsFactors = FALSE
    ),
  ),
  list(classification = TRUE)
)
ranger_cv$performance_metric_args <- list(positive = "1", negative = "0")
ranger_cv$performance_metric <- mlexperiments::metric("AUC")

# set data
ranger_cv$set_data(

```

```

      x = train_x,
      y = train_y
    )

    ranger_cv$execute()

## -----
## Method `LearnerRanger$new`
## -----

LearnerRanger$new()

```

LearnerXgboost

R6 Class to construct a Xgboost learner

Description

The LearnerXgboost class is the interface to the xgboost R package for use with the `mlexperiments` package.

Details

Optimization metric: needs to be specified with the learner parameter `eval_metric`. The following options can be set via `options()`:

- "mlexperiments.optim.xgb.nrounds" (default: 5000L)
- "mlexperiments.optim.xgb.early_stopping_rounds" (default: 500L)
- "mlexperiments.xgb.print_every_n" (default: 50L)
- "mlexperiments.xgb.verbose" (default: FALSE)

LearnerXgboost can be used with

- [mlexperiments::MLTuneParameters](#)
- [mlexperiments::MLCrossValidation](#)
- [mlexperiments::MLNestedCV](#)

Super class

[mlexperiments::MLLearnerBase](#) -> LearnerXgboost

Methods

Public methods:

- [LearnerXgboost\\$new\(\)](#)
- [LearnerXgboost\\$clone\(\)](#)

Method `new()`: Create a new `LearnerXgboost` object.

Usage:

```
LearnerXgboost$new(metric_optimization_higher_better)
```

Arguments:

`metric_optimization_higher_better` A logical. Defines the direction of the optimization metric used throughout the hyperparameter optimization.

Returns: A new `LearnerXgboost` R6 object.

Examples:

```
LearnerXgboost$new(metric_optimization_higher_better = FALSE)
```

Method `clone()`: The objects of this class are cloneable with this method.

Usage:

```
LearnerXgboost$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

See Also

[xgboost::xgb.train\(\)](#), [xgboost::xgb.cv\(\)](#)

Examples

```
# binary classification
Sys.setenv("OMP_THREAD_LIMIT" = 2)

library(mlbench)
data("PimaIndiansDiabetes2")
dataset <- PimaIndiansDiabetes2 |>
  data.table::as.data.table() |>
  na.omit()

seed <- 123
feature_cols <- colnames(dataset)[1:8]

param_list_xgboost <- expand.grid(
  subsample = seq(0.6, 1, .2),
  colsample_bytree = seq(0.6, 1, .2),
  min_child_weight = seq(1, 5, 4),
  learning_rate = seq(0.1, 0.2, 0.1),
  max_depth = seq(1, 5, 4),
  nthread = 2
```

```

)

train_x <- model.matrix(
  ~ -1 + .,
  dataset[, .SD, .SDcols = feature_cols]
)
train_y <- as.integer(dataset[, get("diabetes")]) - 1L

fold_list <- splitTools::create_folds(
  y = train_y,
  k = 3,
  type = "stratified",
  seed = seed
)
xgboost_cv <- mlexperiments::MLCrossValidation$new(
  learner = mllrnrs::LearnerXgboost$new(
    metric_optimization_higher_better = FALSE
  ),
  fold_list = fold_list,
  ncores = 2L,
  seed = 123
)
xgboost_cv$learner_args <- c(
  as.list(
    data.table::data.table(
      param_list_xgboost[37, ],
      stringsAsFactors = FALSE
    ),
  ),
  list(
    objective = "binary:logistic",
    eval_metric = "logloss"
  ),
  nrounds = 45L
)
xgboost_cv$performance_metric_args <- list(positive = "1", negative = "0")
xgboost_cv$performance_metric <- mlexperiments::metric("AUC")

# set data
xgboost_cv$set_data(
  x = train_x,
  y = train_y
)

xgboost_cv$execute()

## -----
## Method `LearnerXgboost$new`
## -----

LearnerXgboost$new(metric_optimization_higher_better = FALSE)

```

Index

`glmnet::cv.glmnet()`, [3](#)

`glmnet::glmnet()`, [3](#)

`LearnerGlmnet`, [2](#)

`LearnerLightgbm`, [4](#)

`LearnerRanger`, [7](#)

`LearnerXgboost`, [9](#)

`lightgbm::lgb.cv()`, [5](#)

`lightgbm::lgb.train()`, [5](#)

`ml experiments::MLCrossValidation`, [2](#), [4](#),
[7](#), [9](#)

`ml experiments::MLLearnerBase`, [2](#), [4](#), [7](#), [9](#)

`ml experiments::MLNestedCV`, [2](#), [4](#), [7](#), [9](#)

`ml experiments::MLTuneParameters`, [2](#), [4](#), [7](#),
[9](#)

`ranger::ranger()`, [7](#)

`xgboost::xgb.cv()`, [10](#)

`xgboost::xgb.train()`, [10](#)