Package ‘mlr3learners’

December 21, 2023

Title Recommended Learners for 'mlr3'

Version 0.5.8

Description Recommended Learners for 'mlr3'. Extends 'mlr3' with interfaces to essential machine learning packages on CRAN. This includes, but is not limited to: (penalized) linear and logistic regression, linear and quadratic discriminant analysis, k-nearest neighbors, naive Bayes, support vector machines, and gradient boosting.

License LGPL-3


BugReports https://github.com/mlr-org/mlr3learners/issues

Depends mlr3 (>= 0.14.1), R (>= 3.1.0)

Imports checkmate, data.table, mlr3misc (>= 0.9.4), paradox, R6

Suggests DiceKriging, e1071, glmnet, kknn, knitr, lgr, MASS, nnet, pracma, ranger, rgenoud, rmarkdown, testthat (>= 3.0.0), xgboost (>= 1.6.0)

Config/testthat/edition 3

Encoding UTF-8

NeedsCompilation no

RoxygenNote 7.2.3

Collate 'aaa.R' 'LearnerClassifCVGlmnet.R' 'LearnerClassifGlmnet.R' 'LearnerClassifKKNN.R' 'LearnerClassifLDA.R' 'LearnerClassifLogReg.R' 'LearnerClassifMultinom.R' 'LearnerClassifNaiveBayes.R' 'LearnerClassifNnet.R' 'LearnerClassifQDA.R' 'LearnerClassifRanger.R' 'LearnerClassifSVM.R' 'LearnerClassifXgboost.R' 'LearnerRegrCVGlmnet.R' 'LearnerRegrGlmnet.R' 'LearnerRegrKKNN.R' 'LearnerRegrKM.R' 'LearnerRegrLM.R' 'LearnerRegrNnet.R' 'LearnerRegrRanger.R' 'LearnerRegrSVM.R' 'LearnerRegrXgboost.R' 'bibentries.R' 'helpers.R' 'helpers_glmnet.R' 'helpers_ranger.R' 'zzz.R'
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**Repository**  CRAN

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### R topics documented:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>mlr3learners-package</td>
<td>2</td>
</tr>
<tr>
<td>mlr_learners_classif.cv_glmnet</td>
<td>3</td>
</tr>
<tr>
<td>mlr_learners_classif.glmnet</td>
<td>6</td>
</tr>
<tr>
<td>mlr_learners_classif.kknn</td>
<td>10</td>
</tr>
<tr>
<td>mlr_learners_classif.lda</td>
<td>13</td>
</tr>
<tr>
<td>mlr_learners_classif.log_reg</td>
<td>15</td>
</tr>
<tr>
<td>mlr_learners_classif.multinom</td>
<td>18</td>
</tr>
<tr>
<td>mlr_learners_classif.naive_bayes</td>
<td>21</td>
</tr>
<tr>
<td>mlr_learners_classif.nnet</td>
<td>23</td>
</tr>
<tr>
<td>mlr_learners_classif.qda</td>
<td>26</td>
</tr>
<tr>
<td>mlr_learners_classif.ranger</td>
<td>29</td>
</tr>
<tr>
<td>mlr_learners_classif.svm</td>
<td>32</td>
</tr>
<tr>
<td>mlr_learners_classif.xgboost</td>
<td>35</td>
</tr>
<tr>
<td>mlr_learners_regr.cv_glmnet</td>
<td>40</td>
</tr>
<tr>
<td>mlr_learners_regr.glmnet</td>
<td>43</td>
</tr>
<tr>
<td>mlr_learners_regr.kknn</td>
<td>47</td>
</tr>
<tr>
<td>mlr_learners_regr.km</td>
<td>50</td>
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<tr>
<td>mlr_learners_regr.lm</td>
<td>53</td>
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<tr>
<td>mlr_learners_regr.xgboost</td>
<td>64</td>
</tr>
</tbody>
</table>

**Index** 70

---

**mlr3learners-package  mlr3learners: Recommended Learners for 'mlr3’**

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**Description**

More learners are implemented in the mlr3extralearners package. A guide on how to create custom learners is covered in the book: [https://mlr3book.mlr-org.com](https://mlr3book.mlr-org.com). Feel invited to contribute a missing learner to the mlr3 ecosystem!
mlr_learners_classif.cv_glmnet

Description

Generalized linear models with elastic net regularization. Calls `glmnet::cv.glmnet()` from package `glmnet`.

The default for hyperparameter family is set to "binomial" or "multinomial", depending on the number of classes.

Dictionary

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("classif.cv_glmnet")
lrn("classif.cv_glmnet")
```

Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: `mlr3`, `mlr3learners`, `glmnet`

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**Internal Encoding**

Starting with mlr3 v0.5.0, the order of class labels is reversed prior to model fitting to comply to the stats::glm() convention that the negative class is provided as the first factor level.

**Super classes**

mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifCVGlmnet

**Methods**

**Public methods:**

- LearnerClassifCVGlmnet$new()
- LearnerClassifCVGlmnet$selected_features()
- LearnerClassifCVGlmnet$clone()

**Method new():** Creates a new instance of this R6 class.

*Usage:*

LearnerClassifCVGlmnet$new()

**Method selected_features():** Returns the set of selected features as reported by glmnet::predict.glmnet() with type set to "nonzero".

*Usage:*

LearnerClassifCVGlmnet$selected_features(lambda = NULL)

*Arguments:*

lambda (numeric(1))

Custom lambda, defaults to the active lambda depending on parameter set.

*Returns:*

(character()) of feature names.

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

*Usage:*

LearnerClassifCVGlmnet$clone(deep = FALSE)

*Arguments:*

deep Whether to make a deep clone.

**References**


**See Also**

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
• as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
• mlr3pipelines to combine learners with pre- and postprocessing steps.
• Extension packages for additional task types:
  – mlr3proba for probabilistic supervised regression and survival analysis.
  – mlr3cluster for unsupervised clustering.
• mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("glmnet", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.cv_glmnet")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```

mlr_learners_classif.glmnet

**GLM with Elastic Net Regularization Classification Learner**
mlr_learners_classif.glmnet

Description

Generalized linear models with elastic net regularization. Calls \texttt{glmnet::glmnet()} from package \texttt{glmnet}.

Details

Caution: This learner is different to learners calling \texttt{glmnet::cv.glmnet()} in that it does not use the internal optimization of parameter \texttt{lambda}. Instead, \texttt{lambda} needs to be tuned by the user (e.g., via \texttt{mlr3tuning}). When \texttt{lambda} is tuned, the \texttt{glmnet} will be trained for each tuning iteration. While fitting the whole path of \texttt{lambda}s would be more efficient, as is done by default in \texttt{glmnet::glmnet()}, tuning/selecting the parameter at prediction time (using parameter \texttt{s}) is currently not supported in \texttt{mlr3} (at least not in efficient manner). Tuning the \texttt{s} parameter is, therefore, currently discouraged.

When the data are i.i.d. and efficiency is key, we recommend using the respective auto-tuning counterparts in \texttt{mlr_learners_classif.cv_glmnet()} or \texttt{mlr_learners_regr.cv_glmnet()}. However, in some situations this is not applicable, usually when data are imbalanced or not i.i.d. (longitudinal, time-series) and tuning requires custom resampling strategies (blocked design, stratification).

Dictionary

This Learner can be instantiated via the dictionary \texttt{mlr_learners} or with the associated sugar function \texttt{lrn()}:

\begin{verbatim}
mlr_learners$get("classif.glmnet")
lrn("classif.glmnet")
\end{verbatim}

Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: \texttt{mlr3, mlr3learners, glmnet}

Parameters

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# mlr_learners_classif.glmnet

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## Internal Encoding

Starting with mlr3 v0.5.0, the order of class labels is reversed prior to model fitting to comply to the stats::glm() convention that the negative class is provided as the first factor level.

## Super classes

mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifGlmnet

## Methods

**Public methods:**

- LearnerClassifGlmnet$new()
- LearnerClassifGlmnet$selected_features()
- LearnerClassifGlmnet$clone()

**Method** new(): Creates a new instance of this R6 class.

**Usage:**
LearnerClassifGlmnet$new()

**Method** `selected_features()`: Returns the set of selected features as reported by `glmnet::predict.glmnet()` with `type` set to "nonzero".

**Usage:**
LearnerClassifGlmnet$selected_features(lambda = NULL)

**Arguments:**
lambda (numeric(1))
  Custom lambda, defaults to the active lambda depending on parameter set.

**Returns:** (character()) of feature names.

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

**Usage:**
LearnerClassifGlmnet$clone(deep = FALSE)

**Arguments:**
deep  Whether to make a deep clone.

**References**

**See Also**
- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.

Examples

if (requireNamespace("glmnet", quietly = TRUE)) {
# Define the Learner and set parameter values
learner = lrn("classif.glmnet")
print(learner)

# Define a Task
task = tsk("sonar")

# Create train and test set
ids = partition(task)

# Train the learner on the training ids
learner$train(task, row_ids = ids$train)

# print the model
print(learner$model)

# importance method
if("importance" %in% learner$properties) print(learner$importance)

# Make predictions for the test rows
predictions = learner$predict(task, row_ids = ids$test)

# Score the predictions
predictions$score()
}

mlr_learners_classif.kknn

_k-Nearest-Neighbor Classification Learner_

Description

k-Nearest-Neighbor classification. Calls \texttt{knnc()} from package \texttt{kknn}.

Initial parameter values

- \texttt{store.model}:
  - See note.

Dictionary

This Learner can be instantiated via the \texttt{dictionary mlr_learners} or with the associated sugar function \texttt{lrn()}:

\begin{verbatim}
mlr_learners$get("classif.kknn")
lrn("classif.kknn")
\end{verbatim}
Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “factor”, “ordered”
- Required Packages: mlr3, mlr3learners, kknn

Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>k</td>
<td>integer</td>
<td>7</td>
<td>[1, ∞)</td>
</tr>
<tr>
<td>distance</td>
<td>numeric</td>
<td>2</td>
<td>[0, ∞)</td>
</tr>
<tr>
<td>kernel</td>
<td>character</td>
<td>optimal</td>
<td>rectangular, triangular, epanechnikov, biweight, triweight, cos, inv, gaussian, rank, optimal</td>
</tr>
<tr>
<td>scale</td>
<td>logical</td>
<td>TRUE</td>
<td>TRUE, FALSE</td>
</tr>
<tr>
<td>ykernel</td>
<td>untyped</td>
<td></td>
<td></td>
</tr>
<tr>
<td>store_model</td>
<td>logical</td>
<td>FALSE</td>
<td>TRUE, FALSE</td>
</tr>
</tbody>
</table>

Super classes

mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifKKNN

Methods

Public methods:

- LearnerClassifKKNN$new()
- LearnerClassifKKNN$clone()

Method new(): Creates a new instance of this R6 class.

Usage:
LearnerClassifKKNN$new()

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

Usage:
LearnerClassifKKNN$clone(deep = FALSE)

Arguments:
- deep: Whether to make a deep clone.

Note

There is no training step for k-NN models, just storing the training data to process it during the predict step. Therefore, $model returns a list with the following elements:

- formula: Formula for calling kknn::kknn() during $predict().
mlr_learners_classif.kknn

- data: Training data for calling `kknn::kknn()` during `$predict()`.
- pv: Training parameters for calling `kknn::kknn()` during `$predict()`.
- kknn: Model as returned by `kknn::kknn()`, only available after `$predict()` has been called. This is not stored by default, you must set hyperparameter `store_model` to TRUE.

References


See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("kknn", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.kknn")
  print(learner)

  # Define a Task
  task = tsk("sonar")
}
```
# Create train and test set
ids = partition(task)

# Train the learner on the training ids
learner$train(task, row_ids = ids$train)

# print the model
print(learner$model)

# importance method
if("importance" %in% learner$properties) print(learner$importance)

# Make predictions for the test rows
predictions = learner$predict(task, row_ids = ids$test)

# Score the predictions
predictions$score()

mlr_learners_classif.lda

*Linear Discriminant Analysis Classification Learner*

**Description**

Linear discriminant analysis. Calls `MASS::lda()` from package `MASS`.

**Details**

Parameters `method` and `prior` exist for training and prediction but accept different values for each. Therefore, arguments for the predict stage have been renamed to `predict.method` and `predict.prior`, respectively.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```
mlr_learners$get("classif.lda")
lrn("classif.lda")
```

**Meta Information**

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “factor”, “ordered”
- Required Packages: `mlr3`, `mlr3learners`, `MASS`

**Parameters**
### Id
- **dimen**
- **method**
- **nu**
- **predict.method**
- **predict.prior**
- **prior**
- **tol**

### Type
- **dimen**: untyped
- **method**: character
- **nu**: integer
- **predict.method**: character
- **predict.prior**: untyped
- **prior**: untyped
- **tol**: numeric

### Default
- **dimen**: -
- **method**: moment
- **nu**: -
- **predict.method**: plug-in
- **predict.prior**: -
- **prior**: -
- **tol**: -

### Levels
- **dimen**: -
- **method**: moment, mle, mve, t
- **nu**: $(-\infty, \infty)$
- **predict.method**: plug-in, predictive, debiased
- **predict.prior**: -
- **prior**: -
- **tol**: $(-\infty, \infty)$

### Range
- **dimen**: -
- **method**: -
- **nu**: $(-\infty, \infty)$
- **predict.method**: -
- **predict.prior**: -
- **prior**: -
- **tol**: $(-\infty, \infty)$

### Super classes
- `mlr3::Learner` -> `mlr3::LearnerClassif` -> `LearnerClassifLDA`

### Methods

**Public methods:**
- `LearnerClassifLDA$new()`
- `LearnerClassifLDA$clone()`

**Method new():** Creates a new instance of this R6 class.

*Usage:*

`LearnerClassifLDA$new()`

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

*Usage:*

`LearnerClassifLDA$clone(deep = FALSE)`

*Arguments:*

- `deep` Whether to make a deep clone.

### References


### See Also

- Package [mlr3extralearners](https://mlr3extralearners.mlr-org.com/) for more learners.
- Dictionary of Learners: `mlr_learners`
- `as.data.table(mlr_learners)` for a table of available Learners in the running session (depending on the loaded packages).
- [mlr3pipelines](https://mlr3pipelines.mlr-org.com/) to combine learners with pre- and postprocessing steps.
Logistic Regression Classification Learner

Description

Classification via logistic regression. Calls \texttt{stats::glm()} with family set to "binomial".
**Internal Encoding**

Starting with `mlr3` v0.5.0, the order of class labels is reversed prior to model fitting to comply to the `stats::glm()` convention that the negative class is provided as the first factor level.

**Weights**

It is not advisable to change the weights of a logistic regression. For more details, see this question on Cross Validated.

**Initial parameter values**

- `model`:
  - Actual default: TRUE.
  - Adjusted default: FALSE.
  - Reason for change: Save some memory.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("classif.log_reg")
```

**Meta Information**

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “character”, “factor”, “ordered”
- Required Packages: `mlr3`, `mlr3learners`, 'stats'

**Parameters**

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>epsilon</td>
<td>numeric</td>
<td>1e-08</td>
<td></td>
<td>($-\infty, \infty$)</td>
</tr>
<tr>
<td>etastart</td>
<td>untyped</td>
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<td></td>
<td>-</td>
</tr>
<tr>
<td>maxit</td>
<td>numeric</td>
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<td>TRUE, FALSE</td>
<td>-</td>
</tr>
<tr>
<td>mustart</td>
<td>untyped</td>
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<td>-</td>
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<td>TRUE, FALSE</td>
<td>-</td>
</tr>
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<tr>
<td>y</td>
<td>logical</td>
<td>TRUE</td>
<td>TRUE, FALSE</td>
<td>-</td>
</tr>
</tbody>
</table>
Contrasts

To ensure reproducibility, this learner always uses the default contrasts:

- `contr.treatment()` for unordered factors, and
- `contr.poly()` for ordered factors.

Setting the option "contrasts" does not have any effect. Instead, set the respective hyperparameter or use `mlr3pipelines` to create dummy features.

Super classes

```
mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifLogReg
```

Methods

**Public methods:**

- `LearnerClassifLogReg$new()`
- `LearnerClassifLogReg$loglik()`
- `LearnerClassifLogReg$clone()`

**Method new():** Creates a new instance of this R6 class.

*Usage:*

```
LearnerClassifLogReg$new()
```

**Method loglik():** Extract the log-likelihood (e.g., via `stats::logLik()` from the fitted model.

*Usage:*

```
LearnerClassifLogReg$loglik()
```

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

*Usage:*

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

*Arguments:*

- `deep` Whether to make a deep clone.

See Also

- Package `mlr3extralearners` for more learners.
- Dictionary of Learners: `mlr_learners`
- `as.data.table(mlr_learners)` for a table of available Learners in the running session (depending on the loaded packages).
- `mlr3pipelines` to combine learners with pre- and postprocessing steps.
Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.

mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

if (requireNamespace("stats", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.log_reg")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}

mlr_learners_classif.multinom

Multinomial log-linear learner via neural networks

Description

Dictionary

This Learner can be instantiated via the dictionary mlr_learners or with the associated sugar function lrn():

```r
mlr_learners$get("classif.multinom")
lrn("classif.multinom")
```

Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “factor”
- Required Packages: mlr3, mlr3learners, nnet

Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
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<td>-</td>
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<td>1e-04</td>
<td>(−∞, ∞)</td>
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<td>FALSE</td>
<td>TRUE, FALSE</td>
<td>-</td>
</tr>
<tr>
<td>decay</td>
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<td>-</td>
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<td></td>
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<td></td>
</tr>
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<td>[1, ∞)</td>
<td></td>
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<td>-</td>
</tr>
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<td>-</td>
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<td></td>
</tr>
<tr>
<td>reltol</td>
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<td>1e-08</td>
<td>(−∞, ∞)</td>
<td></td>
</tr>
<tr>
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<td>-</td>
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<td>-</td>
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<td>trace</td>
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<td>TRUE, FALSE</td>
<td>-</td>
</tr>
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<td>Wts</td>
<td>untyped</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Super classes

mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifMultinom

Methods

Public methods:
- LearnerClassifMultinom$new()
• LearnerClassifMultinom$loglik()
• LearnerClassifMultinom$clone()

Method new(): Creates a new instance of this R6 class.
Usage:
LearnerClassifMultinom$new()

Method loglik(): Extract the log-likelihood (e.g., via stats::logLik() from the fitted model.
Usage:
LearnerClassifMultinom$loglik()

Method clone(): The objects of this class are cloneable with this method.
Usage:
LearnerClassifMultinom$clone(deep = FALSE)
Arguments:
depth Whether to make a deep clone.

See Also
• Package mlr3extralearners for more learners.
• Dictionary of Learners: mlr_learners
• as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
• mlr3pipelines to combine learners with pre- and postprocessing steps.
• Extension packages for additional task types:
  – mlr3proba for probabilistic supervised regression and survival analysis.
  – mlr3cluster for unsupervised clustering.
• mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples
if (requireNamespace("nnet", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.multinom")
  print(learner)
```r
# Define a Task
task = tsk("sonar")

# Create train and test set
ids = partition(task)

# Train the learner on the training ids
learner$train(task, row_ids = ids$train)

# print the model
print(learner$model)

# importance method
if("importance" %in% learner$properties) print(learner$importance)

# Make predictions for the test rows
predictions = learner$predict(task, row_ids = ids$test)

# Score the predictions
predictions$score()
```

---

**Naive Bayes Classification Learner**

**Description**

Naive Bayes classification. Calls `e1071::naiveBayes()` from package `e1071`.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("classif.naive_bayes")
lrn("classif.naive_bayes")
```

**Meta Information**

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “factor”
- Required Packages: `mlr3`, `mlr3learners`, `e1071`
Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>eps</td>
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<td>0</td>
<td>$(-\infty, \infty)$</td>
</tr>
<tr>
<td>laplace</td>
<td>numeric</td>
<td>0</td>
<td>$[0, \infty)$</td>
</tr>
<tr>
<td>threshold</td>
<td>numeric</td>
<td>0.001</td>
<td>$(-\infty, \infty)$</td>
</tr>
</tbody>
</table>

Super classes

mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifNaiveBayes

Methods

Public methods:

- LearnerClassifNaiveBayes$new()
- LearnerClassifNaiveBayes$clone()

Method **new()**: Creates a new instance of this R6 class.

Usage:
LearnerClassifNaiveBayes$new()

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

Usage:
LearnerClassifNaiveBayes$clone(deep = FALSE)

Arguments:
deepeitherwhethertomakeadeepclone.

See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
mlr_learners_classif.nnet

- **mlr3tuning** for tuning of hyperparameters, **mlr3tuningspaces** for established default tuning spaces.


Examples

```r
if (requireNamespace("e1071", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.naive_bayes")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```

---

**mlr_learners_classif.nnet**

*Classification Neural Network Learner*

**Description**

Single Layer Neural Network. Calls `nnet::nnet.formula()` from package `nnet`.

Note that modern neural networks with multiple layers are connected via package `mlr3keras`.
Dictionary

This Learner can be instantiated via the dictionary mlr_learners or with the associated sugar function lrn():

mlr_learners$get("classif.nnet")
lrn("classif.nnet")

Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “integer”, “numeric”, “factor”, “ordered”
- Required Packages: mlr3, mlr3learners, nnet

Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hess</td>
<td>logical</td>
<td>FALSE</td>
<td>TRUE, FALSE</td>
<td>-</td>
</tr>
<tr>
<td>MaxNWts</td>
<td>integer</td>
<td>1000</td>
<td></td>
<td>[1, ∞)</td>
</tr>
<tr>
<td>Wts</td>
<td>untyped</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>abstol</td>
<td>numeric</td>
<td>1e-04</td>
<td></td>
<td>(−∞, ∞)</td>
</tr>
<tr>
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</tr>
<tr>
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<td>-</td>
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<td>1e-08</td>
<td></td>
<td>(−∞, ∞)</td>
</tr>
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<td>[0, ∞)</td>
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<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>trace</td>
<td>logical</td>
<td>TRUE</td>
<td>TRUE, FALSE</td>
<td>-</td>
</tr>
<tr>
<td>formula</td>
<td>untyped</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Initial parameter values

- size:
  - Adjusted default: 3L.
  - Reason for change: no default in nnet().

Custom mlr3 parameters

- formula: if not provided, the formula is set to task$formula().
Super classes

mlr3::Learner -> mlr3::LearnerClassif -> LearnerClassifNnet

Methods

Public methods:

- LearnerClassifNnet$new()
- LearnerClassifNnet$clone()

Method new(): Creates a new instance of this R6 class.

Usage:

LearnerClassifNnet$new()

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

Usage:

LearnerClassifNnet$clone(deep = FALSE)

Arguments:

depth Whether to make a deep clone.

References


See Also

- Chapter in the mlrbook: https://mlrbook.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.

Examples

```r
if (requireNamespace("nnet", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.nnet")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  #importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```

---

**mlr_learners_classif.qda**

*Quadratic Discriminant Analysis Classification Learner*

**Description**

Quadratic discriminant analysis. Calls `MASS::qda()` from package `MASS`.

**Details**

Parameters `method` and `prior` exist for training and prediction but accept different values for each. Therefore, arguments for the predict stage have been renamed to `predict.method` and `predict.prior`, respectively.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("classif.qda")
lrn("classif.qda")
```
Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “factor”, “ordered”
- Required Packages: mlr3, mlr3learners, MASS

Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
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<td>-</td>
</tr>
<tr>
<td>nu</td>
<td>integer</td>
<td>-</td>
<td>plug-in</td>
<td>$(-\infty, \infty)$</td>
</tr>
<tr>
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<td>character</td>
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<td>plug-in, predictive, debiased</td>
<td>-</td>
</tr>
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<td>predict.prior</td>
<td>untyped</td>
<td>-</td>
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<tr>
<td>prior</td>
<td>untyped</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Super classes

mlr3::Learner –> mlr3::LearnerClassif –> LearnerClassifQDA

Methods

Public methods:
- LearnerClassifQDA$new()
- LearnerClassifQDA$clone()

Method new(): Creates a new instance of this R6 class.

Usage:
LearnerClassifQDA$new()

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

Usage:
LearnerClassifQDA$clone(deep = FALSE)

Arguments:
depth Whether to make a deep clone.

References

See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("MASS", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.qda")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```
Ranger Classification Learner

Description

Random classification forest. Calls `ranger::ranger()` from package `ranger`.

Custom mlr3 parameters

- `mtry`:
  - This hyperparameter can alternatively be set via our hyperparameter `mtry.ratio` as `mtry = max(ceiling(mtry.ratio * n_features), 1)`. Note that `mtry` and `mtry.ratio` are mutually exclusive.

Initial parameter values

- `num.threads`:
  - Actual default: `NULL`, triggering auto-detection of the number of CPUs.
  - Adjusted value: `1`.
  - Reason for change: Conflicting with parallelization via `future`.

Dictionary

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("classif.ranger")
lrn("classif.ranger")
```

Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”, “character”, “factor”, “ordered”
- Required Packages: `mlr3`, `mlr3learners`, `ranger`

Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>alpha</td>
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<td>0.5</td>
<td></td>
<td>(−∞, ∞)</td>
</tr>
<tr>
<td>always.split.variables</td>
<td>untyped</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>class.weights</td>
<td>untyped</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>holdout</td>
<td>logical</td>
<td>FALSE</td>
<td>TRUE, FALSE</td>
<td>-</td>
</tr>
<tr>
<td>importance</td>
<td>character</td>
<td>-</td>
<td>none, impurity, impurity_corrected, permutation</td>
<td>-</td>
</tr>
</tbody>
</table>
mlr_learners_classif.ranger

```
keep.inbag       logical    FALSE  TRUE, FALSE
max.depth       integer    NULL    [0, ∞)
min.bucket      integer    1       [1, ∞)
min.node.size   integer    NULL    [1, ∞)
minprop         numeric    0.1     (−∞, ∞)
nttry           integer    -       [1, ∞)
mtry.ratio      numeric    -       [0, 1]
node.stats      logical    FALSE  TRUE, FALSE
num.random.splits integer    1       [1, ∞)
nnum.threads    integer    1       [1, ∞)
nnum.trees      integer    500     [1, ∞)
oob.error       logical    TRUE   TRUE, FALSE
regularization.factor untyped    1       -
regularization.usedepth logical    FALSE  TRUE, FALSE
replace         logical    TRUE   TRUE, FALSE
respect.unordered.factors character ignore ignore, order, partition
sample.fraction numeric    -       [0, 1]
save.memory     logical    FALSE  TRUE, FALSE
scale.permutation.importance logical    FALSE  TRUE, FALSE
se.method       character    infjack jack, infjack
seed            integer    NULL    (−∞, ∞)
split.select.weights untyped    -       -
splitrule       character    gini    gini, extratrees, hellinger
verbose         logical    TRUE   TRUE, FALSE
write.forest    logical    TRUE   TRUE, FALSE
```

Super classes

`mlr3::Learner` - `mlr3::LearnerClassif` - `LearnerClassifRanger`

Methods

Public methods:

- `LearnerClassifRanger$new()`
- `LearnerClassifRanger$importance()`
- `LearnerClassifRanger$oob_error()`
- `LearnerClassifRanger$clone()`

Method `new()`: Creates a new instance of this R6 class.

Usage:

```r
LearnerClassifRanger$new()
```

Method `importance()`: The importance scores are extracted from the model slot `variable.importance`. Parameter `importance.mode` must be set to "impurity", "impurity_corrected", or "permutation".

```r
LearnerClassifRanger$importance()
```
Usage:
LearnerClassifRanger$importance()
Returns: Named numeric().

Method oob_error(): The out-of-bag error, extracted from model slot prediction.error.
Usage:
LearnerClassifRanger$oob_error()
Returns: numeric(1).

Method clone(): The objects of this class are cloneable with this method.
Usage:
LearnerClassifRanger$clone(deep = FALSE)
Arguments:
deep Whether to make a deep clone.

References

jss.v077.i01.

Breiman, Leo (2001). “Random Forests.” Machine Learning, 45(1), 5–32. ISSN 1573-0565,

See Also

  and_basic_modeling.html#sec-learners
- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (de-
  pending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning
  spaces.

Other Learner: mlr_learners_classif.cv_glmnet, mlr_learners_classif.glmnet, mlr_learners_classif.kknn,
mlr_learners_classif.lda, mlr_learners_classif.log_reg, mlr_learners_classif.multinom,
mlr_learners_classif.naive_bayes, mlr_learners_classif.nnet, mlr_learners_classif.qda,
mlr_learners_classif.svm, mlr_learners_classif.xgboost, mlr_learners_regr.cv_glmnet,
mlr_learners_regr.glmnet, mlr_learners_regr.kknn, mlr_learners_regr.km, mlr_learners_regr.lm,
mlr_learners_regr.nnet, mlr_learners_regr.ranger, mlr_learners_regr.svm, mlr_learners_regr.xgboost
Examples

```r
if (requireNamespace("ranger", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.ranger")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```

*mlr_learners_classif.svm*

*Support Vector Machine*

**Description**

Support vector machine for classification. Calls `e1071::svm()` from package `e1071`.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("classif.svm")
lrn("classif.svm")
```

**Meta Information**

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: `mlr3`, `mlr3learners`, `e1071`
Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>(−∞, ∞)</td>
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<tr>
<td>class.weights</td>
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<td></td>
<td>-</td>
</tr>
<tr>
<td>coef0</td>
<td>numeric</td>
<td>0</td>
<td></td>
<td>(−∞, ∞)</td>
</tr>
<tr>
<td>cost</td>
<td>numeric</td>
<td>1</td>
<td></td>
<td>[0, ∞)</td>
</tr>
<tr>
<td>cross</td>
<td>integer</td>
<td>0</td>
<td></td>
<td>[0, ∞)</td>
</tr>
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<td>decision.values</td>
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<td>-</td>
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<td>degree</td>
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<td></td>
<td>[1, ∞)</td>
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<td>epsilon</td>
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<td>[0, ∞)</td>
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<td>TRUE, FALSE</td>
<td>-</td>
</tr>
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<td>gamma</td>
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<td>[0, ∞)</td>
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<td></td>
<td>(−∞, ∞)</td>
</tr>
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<td>-</td>
</tr>
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<td>[0, ∞)</td>
</tr>
<tr>
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<td>character</td>
<td>C-classification</td>
<td>C-classification, nu-classification</td>
<td>-</td>
</tr>
</tbody>
</table>

Super classes

`mlr3::Learner` -> `mlr3::LearnerClassif` -> LearnerClassifSVM

Methods

Public methods:

- `LearnerClassifSVM$new()`
- `LearnerClassifSVM$clone()`

Method `new()`: Creates a new instance of this R6 class.

Usage:

`LearnerClassifSVM$new()`

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

Usage:

`LearnerClassifSVM$clone(deep = FALSE)`

Arguments:

- `deep` Whether to make a deep clone.

References

See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("e1071", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.svm")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```
Extreme Gradient Boosting Classification Learner

Description

eXtreme Gradient Boosting classification. Calls xgboost::xgb.train() from package xgboost.

If not specified otherwise, the evaluation metric is set to the default "logloss" for binary classification problems and set to "mlogloss" for multiclass problems. This was necessary to silence a deprecation warning.

Note that using the watchlist parameter directly will lead to problems when wrapping this Learner in a mlr3pipelines GraphLearner as the preprocessing steps will not be applied to the data in the watchlist.

Initial parameter values

- **nrounds**:
  - Actual default: no default.
  - Adjusted default: 1.
  - Reason for change: Without a default construction of the learner would error. Just setting a nonsense default to workaround this. nrounds needs to be tuned by the user.

- **nthread**:
  - Actual value: Undefined, triggering auto-detection of the number of CPUs.
  - Adjusted value: 1.
  - Reason for change: Conflicting with parallelization via future.

- **verbose**:
  - Actual default: 1.
  - Adjusted default: 0.
  - Reason for change: Reduce verbosity.

Early stopping

Early stopping can be used to find the optimal number of boosting rounds. The early_stopping_set parameter controls which set is used to monitor the performance. Set early_stopping_set = "test" to monitor the performance of the model on the test set while training. The test set for early stopping can be set with the "test" row role in the mlr3::Task. Additionally, the range must be set in which the performance must increase with early_stopping_rounds and the maximum number of boosting rounds with nrounds. While resampling, the test set is automatically applied from the mlr3::Resampling. Not that using the test set for early stopping can potentially bias the performance scores. See the section on early stopping in the examples.
Dictionary

This Learner can be instantiated via the dictionary mlr_learners or with the associated sugar function lrn():

```r
mlr_learners$get("classif.xgboost")
lrn("classif.xgboost")
```

Meta Information

- Task type: “classif”
- Predict Types: “response”, “prob”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: mlr3, mlr3learners, xgboost

Parameters

<table>
<thead>
<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
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<td>[0, ∞)</td>
</tr>
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<td>(−∞, ∞)</td>
</tr>
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<td>(0, ∞)</td>
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<td>[0, ∞)</td>
</tr>
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<td>(0, ∞)</td>
</tr>
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### SUPER CLASSES

- `mlr3::Learner` → `mlr3::LearnerClassif` → `LearnerClassifXgboost`

### METHODS

**Public methods:**

- `LearnerClassifXgboost$new()`
- `LearnerClassifXgboost$importance()`
- `LearnerClassifXgboost$clone()`
Method `new()`: Creates a new instance of this R6 class.

Usage:
```
LearnerClassifXgboost$new()
```

Method `importance()`: The importance scores are calculated with `xgboost::xgb.importance()`.

Usage:
```
LearnerClassifXgboost$importance()
```

Returns: Named numeric().

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

Usage:
```
LearnerClassifXgboost$clone(deep = FALSE)
```

Arguments:
- `deep` Whether to make a deep clone.

Note


References


See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.

Examples

```r
## Not run:
if (requireNamespace("xgboost", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("classif.xgboost")
  print(learner)

  # Define a Task
  task = tsk("sonar")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
## End(Not run)

## Not run:
# Train learner with early stopping on spam data set
task = tsk("spam")

# Split task into training and test set
split = partition(task, ratio = 0.8)
task$set_row_roles(split$test, "test")

# Set early stopping parameter
learner = lrn("classif.xgboost",
  nrounds = 100,
  early_stopping_rounds = 10,
  early_stopping_set = "test"
)

# Train learner with early stopping
learner$train(task)
## End(Not run)
```
mlr_learners_regr.cv_glmnet

GLM with Elastic Net Regularization Regression Learner

Description

Generalized linear models with elastic net regularization. Calls \texttt{glmnet::cv.glmnet()} from package \texttt{glmnet}.

The default for hyperparameter \texttt{family} is set to "gaussian".

Dictionary

This Learner can be instantiated via the dictionary \texttt{mlr_learners} or with the associated sugar function \texttt{lrn()}:

\begin{verbatim}
mlr_learners$get("regr.cv_glmnet")
lrn("regr.cv_glmnet")
\end{verbatim}

Meta Information

- Task type: "regr"
- Predict Types: “response”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: \texttt{mlr3, mlr3learners, glmnet}

Parameters

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Super classes

`mlr3::Learner` `->` `mlr3::LearnerRegr` `->` `LearnerRegrCVGlmnet`

Methods

Public methods:

- `LearnerRegrCVGlmnet$new()`
- `LearnerRegrCVGlmnet$selected_features()`
- `LearnerRegrCVGlmnet$clone()`

Method `new()`: Creates a new instance of this `R6` class.

Usage:

```r
LearnerRegrCVGlmnet$new()
```

Method `selected_features()`: Returns the set of selected features as reported by `glmnet::predict.glmnet()` with type set to "nonzero".

Usage:

```r
LearnerRegrCVGlmnet$selected_features()
```
LearnerRegrCVGlmnet$selected_features(lambda = NULL)

Arguments:
lambda (numeric(1))
  Custom lambda, defaults to the active lambda depending on parameter set.

Returns: (character()) of feature names.

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

Usage:
LearnerRegrCVGlmnet$clone(deep = FALSE)

Arguments:
deep Whether to make a deep clone.

References

See Also
• Package mlr3extralearners for more learners.
• Dictionary of Learners: mlr_learners
• as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
• mlr3pipelines to combine learners with pre- and postprocessing steps.
• Extension packages for additional task types:
  – mlr3proba for probabilistic supervised regression and survival analysis.
  – mlr3cluster for unsupervised clustering.
• mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples
if (requireNamespace("glmnet", quietly = TRUE)) {
# Define the Learner and set parameter values
learner = lrn("regr.cv_glmnet")
print(learner)
# Define a Task
task = tsk("mtcars")

# Create train and test set
ids = partition(task)

# Train the learner on the training ids
learner$train(task, row_ids = ids$train)

# print the model
print(learner$model)

# importance method
if("importance" %in% learner$properties) print(learner$importance)

# Make predictions for the test rows
predictions = learner$predict(task, row_ids = ids$test)

# Score the predictions
predictions$score()

mlr_learners_regr.glmnet

### Description

Generalized linear models with elastic net regularization. Calls glmnet::glmnet() from package \texttt{glmnet}.

The default for hyperparameter family is set to "gaussian".

### Details

Caution: This learner is different to learners calling glmnet::cv.glmnet() in that it does not use the internal optimization of parameter lambda. Instead, lambda needs to be tuned by the user (e.g., via \texttt{mlr3tuning}). When lambda is tuned, the glmnet will be trained for each tuning iteration. While fitting the whole path of lambdas would be more efficient, as is done by default in glmnet::glmnet(), tuning/selecting the parameter at prediction time (using parameter s) is currently not supported in mlr3 (at least not in efficient manner). Tuning the s parameter is, therefore, currently discouraged.

When the data are i.i.d. and efficiency is key, we recommend using the respective auto-tuning counterparts in mlr_learners_classif.cv_glmnet() or mlr_learners_regr.cv_glmnet(). However, in some situations this is not applicable, usually when data are imbalanced or not i.i.d. (longitudinal, time-series) and tuning requires custom resampling strategies (blocked design, stratification).
Dictionary

This Learner can be instantiated via the dictionary mlr_learners or with the associated sugar function `lrn()`:

```r
mlr_learners$get("regr.glmnet")
lrn("regr.glmnet")
```

Meta Information

- Task type: “regr”
- Predict Types: “response”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: `mlr3`, `mlr3learners`, `glmnet`

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### Super classes

```
mlr3::Learner -> mlr3::LearnerRegr -> LearnerRegrGlmnet
```

### Methods

**Public methods:**

- `LearnerRegrGlmnet$new()`
- `LearnerRegrGlmnet$selected_features()`
- `LearnerRegrGlmnet$clone()`

**Method** `new()`: Creates a new instance of this R6 class.

*Usage:*

```
LearnerRegrGlmnet$new()
```

**Method** `selected_features()`: Returns the set of selected features as reported by `glmnet::predict.glmnet()` with type set to "nonzero".

*Usage:*

```
LearnerRegrGlmnet$selected_features(lambda = NULL)
```

*Arguments:*

- `lambda` (numeric(1))
  
  Custom lambda, defaults to the active lambda depending on parameter set.

*Returns:*

(character()) of feature names.

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

*Usage:*

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

*Arguments:*

- `deep` Whether to make a deep clone.
References


See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("glmnet", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.glmnet")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  }
```
predictions = learner$predict(task, row_ids = ids$test)

# Score the predictions
predictions$score() 
}

---

**mlr_learners_regr.kknn**

*k-Nearest-Neighbor Regression Learner*

**Description**

k-Nearest-Neighbor regression. Calls *kknn::kknn()* from package *kknn*.

**Initial parameter values**

- **store_model:**
  - See note.

**Dictionary**

This Learner can be instantiated via the dictionary *mlr_learners* or with the associated sugar function *lrn()*:

```
mlr_learners$get("regr.kknn")
lrn("regr.kknn")
```

**Meta Information**

- Task type: "regr"
- Predict Types: "response"
- Feature Types: "logical", "integer", "numeric", "factor", "ordered"
- Required Packages: *mlr3, mlr3learners, kknn*

**Parameters**

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<td>rectangular, triangular, epanechnikov, biweight, triweight, cos, inv, gaussian, rank, optimal</td>
</tr>
<tr>
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<td>logical</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>store_model</td>
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<td>FALSE</td>
<td>TRUE, FALSE</td>
</tr>
</tbody>
</table>
Super classes

\texttt{mlr3::Learner} -> \texttt{mlr3::LearnerRegr} -> \texttt{LearnerRegrKKNN}

Methods

**Public methods:**

- \texttt{LearnerRegrKKNN$new()}
- \texttt{LearnerRegrKKNN$clone()}

**Method** \texttt{new()}: Creates a new instance of this \texttt{R6} class.

\textit{Usage:}
\begin{verbatim}
LearnerRegrKKNN$new()
\end{verbatim}

**Method** \texttt{clone()}: The objects of this class are cloneable with this method.

\textit{Usage:}
\begin{verbatim}
LearnerRegrKKNN$clone(deep = FALSE)
\end{verbatim}

\textit{Arguments:}

- \texttt{deep} Whether to make a deep clone.

**Note**

There is no training step for k-NN models, just storing the training data to process it during the predict step. Therefore, \$model returns a list with the following elements:

- \texttt{formula}: Formula for calling \texttt{kknn::kknn()} during \$predict().
- \texttt{data}: Training data for calling \texttt{kknn::kknn()} during \$predict().
- \texttt{pv}: Training parameters for calling \texttt{kknn::kknn()} during \$predict().
- \texttt{kknn}: Model as returned by \texttt{kknn::kknn()}, only available \textbf{after} \$predict() has been called. This is not stored by default, you must set hyperparameter \texttt{store_model} to \texttt{TRUE}.

**References**


See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
  - as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("kknn", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.kknn")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```
Description

Kriging regression. Calls `DiceKriging::km()` from package `DiceKriging`.

- The predict type hyperparameter "type" defaults to "sk" (simple kriging).
- The additional hyperparameter `nugget.stability` is used to overwrite the hyperparameter `nugget` with `nugget.stability * var(y)` before training to improve the numerical stability. We recommend a value of $1e^{-8}$.
- The additional hyperparameter `jitter` can be set to add $N(0, [\text{jitter}])$-distributed noise to the data before prediction to avoid perfect interpolation. We recommend a value of $1e^{-12}$.

Dictionary

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("regr.km")
lrn("regr.km")
```

Meta Information

- Task type: "regr"
- Predict Types: "response", "se"
- Feature Types: "logical", "integer", "numeric"
- Required Packages: `mlr3`, `mlr3learners`, `DiceKriging`

Parameters

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<th>Range</th>
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<td>gauss, matern5_2, matern3_2, exp, powexp</td>
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<td>iso</td>
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knots untyped -
lights.return logical FALSE TRUE, FALSE -
lower untyped -
multistart integer 1 (−∞, ∞)
nb of start points
noise.var untyped -
nubegg numeric (−∞, ∞)
nugget estim logical FALSE TRUE, FALSE -
nugget.stability numeric 0 [0, ∞)
optim.method character BFGS BFGS, gen -
parinit untyped -
penalty untyped -
scaling logical FALSE TRUE, FALSE -
se.compute logical TRUE TRUE, FALSE -
type character SK SK, UK -
upper untyped -

Super classes

mlr3::Learner -> mlr3::LearnerRegr -> LearnerRegrKM

Methods

Public methods:

- LearnerRegrKM$new()
- LearnerRegrKM$clone()

Method new(): Creates a new instance of this R6 class.
Usage:
LearnerRegrKM$new()

Method clone(): The objects of this class are cloneable with this method.
Usage:
LearnerRegrKM$clone(deep = FALSE)

Arguments:
depth Whether to make a deep clone.

References

See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("DiceKriging", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.km")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```
**Description**

Ordinary linear regression. Calls `stats::lm()`.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$predicts("regr.lm")
lrn("regr.lm")
```

**Meta Information**

- Task type: “regr”
- Predict Types: “response”, “se”
- Feature Types: “logical”, “integer”, “numeric”, “character”, “factor”
- Required Packages: `mlr3`, `mlr3learners`, `stats`

**Parameters**

<table>
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<th>Default</th>
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<th>Range</th>
</tr>
</thead>
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<td></td>
<td>(−∞, ∞)</td>
</tr>
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<td>character</td>
<td>-</td>
<td>none, confidence, prediction</td>
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<td>(−∞, ∞)</td>
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</tr>
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<td>FALSE</td>
<td>TRUE, FALSE</td>
<td>-</td>
</tr>
</tbody>
</table>
Contrasts

To ensure reproducibility, this learner always uses the default contrasts:

- `contr.treatment()` for unordered factors, and
- `contr.poly()` for ordered factors.

Setting the option "contrasts" does not have any effect. Instead, set the respective hyperparameter or use `mlr3pipelines` to create dummy features.

Super classes

`mlr3::Learner` -> `mlr3::LearnerRegr` -> `LearnerRegrLM`

Methods

**Public methods:**

- `LearnerRegrLM$new()`
- `LearnerRegrLM$loglik()`
- `LearnerRegrLM$clone()`

**Method new():** Creates a new instance of this R6 class.

*Usage:*

`LearnerRegrLM$new()`

**Method loglik():** Extract the log-likelihood (e.g., via `stats::logLik()` from the fitted model.

*Usage:*

`LearnerRegrLM$loglik()`

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

*Usage:*

`LearnerRegrLM$clone(deep = FALSE)`

*Arguments:*

- `deep` Whether to make a deep clone.

See Also

- Package `mlr3extralearners` for more learners.
- Dictionary of Learners: `mlr_learners`
- `as.data.table(mlr_learners)` for a table of available Learners in the running session (depending on the loaded packages).
- `mlr3pipelines` to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - `mlr3proba` for probabilistic supervised regression and survival analysis.
– `mlr3cluster` for unsupervised clustering.

- `mlr3tuning` for tuning of hyperparameters, `mlr3tuningspaces` for established default tuning spaces.


**Examples**

```r
if (requireNamespace("stats", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.lm")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids@test)

  # Score the predictions
  predictions$score()
}
```

---

**mlr_learners_regr.nnet**

*Neural Network Regression Learner*

**Description**

Single Layer Neural Network. Calls `nnet::nnet.formula()` from package `nnet`.

Note that modern neural networks with multiple layers are connected via package `mlr3keras`.
Dictionary

This Learner can be instantiated via the dictionary \texttt{mlr_learners} or with the associated sugar function \texttt{lrn()}:

\begin{verbatim}
mlr_learners$get("regr.nnet")
lrn("regr.nnet")
\end{verbatim}

Meta Information

- Task type: “regr”
- Predict Types: “response”
- Feature Types: “integer”, “numeric”, “factor”, “ordered”
- Required Packages: \texttt{mlr3, mlr3learners, nnet}

Parameters

<table>
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<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
</tr>
</thead>
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<td>[1, ∞)</td>
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<td></td>
<td>-</td>
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<td>(−∞, ∞)</td>
</tr>
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<td>-</td>
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<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Initial parameter values

- size:
  - Adjusted default: 3L.
  - Reason for change: no default in \texttt{nnet}().

Custom \texttt{mlr3} parameters

- \texttt{formula}: if not provided, the formula is set to \texttt{task$formula()}. 
Super classes

```
mlr3::Learner -> mlr3::LearnerRegr -> LearnerRegrNnet
```

Methods

Public methods:

- `LearnerRegrNnet$new()`
- `LearnerRegrNnet$clone()`

Method `new()`: Creates a new instance of this R6 class.

**Usage:**

```
LearnerRegrNnet$new()
```

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

**Usage:**

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

**Arguments:**

- `deep` Whether to make a deep clone.

References


See Also

- Package `mlr3extralearners` for more learners.
- Dictionary of Learners: `mlr_learners`
- `as.data.table(mlr_learners)` for a table of available Learners in the running session (depending on the loaded packages).
- `mlr3pipelines` to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - `mlr3proba` for probabilistic supervised regression and survival analysis.
  - `mlr3cluster` for unsupervised clustering.
- `mlr3tuning` for tuning of hyperparameters, `mlr3tuningspaces` for established default tuning spaces.

Examples

```r
if (requireNamespace("nnet", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.nnet")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```

---

**mlr_learners_regr.ranger**

*Ranger Regression Learner*

**Description**

Random regression forest. Calls `ranger::ranger()` from package `ranger`.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("regr.ranger")
```

```r
lrn("regr.ranger")
```

**Meta Information**

- Task type: "regr"
- Predict Types: "response", "se"
- Feature Types: "logical", "integer", "numeric", "character", "factor", "ordered"
- Required Packages: `mlr3`, `mlr3learners`, `ranger`
Parameters

<table>
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<tr>
<th>Id</th>
<th>Type</th>
<th>Default</th>
<th>Levels</th>
<th>Range</th>
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Custom mlr3 parameters

- mtry:
  - This hyperparameter can alternatively be set via our hyperparameter mtry.ratio as \(mtry = \text{max}(\text{ceiling}(mtry.ratio \times \text{n_features}), 1)\). Note that mtry and mtry.ratio are mutually exclusive.

Initial parameter values

- num.threads:
  - Actual default: NULL, triggering auto-detection of the number of CPUs.
– Adjusted value: 1.
– Reason for change: Conflicting with parallelization via future.

Super classes

`mlr3::Learner -> mlr3::LearnerRegr -> LearnerRegrRanger`

Methods

Public methods:

• `LearnerRegrRanger$new()`
• `LearnerRegrRanger$importance()`
• `LearnerRegrRanger$oob_error()`
• `LearnerRegrRanger$clone()`

Method `new()`: Creates a new instance of this R6 class.

Usage:
`LearnerRegrRanger$new()`

Method `importance()`: The importance scores are extracted from the model slot `variable.importance`. Parameter `importance.mode` must be set to "impurity", "impurity_corrected", or "permutation"

Usage:
`LearnerRegrRanger$importance()`

Returns: Named numeric().

Method `oob_error()`: The out-of-bag error, extracted from model slot `prediction.error`

Usage:
`LearnerRegrRanger$oob_error()`

Returns: numeric(1).

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

Usage:
`LearnerRegrRanger$clone(deep = FALSE)`

Arguments:

depth Whether to make a deep clone.

References


See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
if (requireNamespace("ranger", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.ranger")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```
Description

Support vector machine for regression. Calls \texttt{e1071::svm()} from package \texttt{e1071}.

Dictionary

This Learner can be instantiated via the dictionary \texttt{mlr_learners} or with the associated sugar function \texttt{lrn()}:

\begin{verbatim}
mlr_learners$get("regr.svm")
lrn("regr.svm")
\end{verbatim}

Meta Information

- Task type: “regr”
- Predict Types: “response”
- Feature Types: “logical”, “integer”, “numeric”
- Required Packages: \texttt{mlr3, mlr3learners, e1071}

Parameters

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</table>
Super classes

`mlr3::Learner` &gt; `mlr3::LearnerRegr` &gt; LearnerRegrSVM

Methods

Public methods:

* LearnerRegrSVM$new()
* LearnerRegrSVM$clone()

Method `new()`: Creates a new instance of this R6 class.

Usage:

LearnerRegrSVM$new()

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

Usage:

LearnerRegrSVM$clone(deep = FALSE)

Arguments:

depth Whether to make a deep clone.

References


See Also

* Package mlr3extralearners for more learners.
* Dictionary of Learners: mlr_learners
* as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
* mlr3pipelines to combine learners with pre- and postprocessing steps.
* Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
* mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.

Examples

```r
if (requireNamespace("e1071", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.svm")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```

---

**mlr_learners_regr.xgboost**

*Extreme Gradient Boosting Regression Learner*

**Description**


Note that using the `watchlist` parameter directly will lead to problems when wrapping this Learner in a `mlr3pipelines` GraphLearner as the preprocessing steps will not be applied to the data in the watchlist.

**Dictionary**

This Learner can be instantiated via the dictionary `mlr_learners` or with the associated sugar function `lrn()`:

```r
mlr_learners$get("regr.xgboost")
lrn("regr.xgboost")
```
Meta Information

- Task type: "regr"
- Predict Types: "response"
- Feature Types: "logical", "integer", "numeric"
- Required Packages: mlr3, mlr3learners, xgboost

Parameters

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</table>
Early stopping

Early stopping can be used to find the optimal number of boosting rounds. The early_stopping_set parameter controls which set is used to monitor the performance. Set early_stopping_set = "test" to monitor the performance of the model on the test set while training. The test set for early stopping can be set with the "test" row role in the mlr3::Task. Additionally, the range must be set in which the performance must increase with early_stopping_rounds and the maximum number of boosting rounds with nrounds. While resampling, the test set is automatically applied from the mlr3::Resampling. Not that using the test set for early stopping can potentially bias the performance scores. See the section on early stopping in the examples.

Initial parameter values

- nrounds:
  - Actual default: no default.
  - Adjusted default: 1.
  - Reason for change: Without a default construction of the learner would error. Just setting a nonsense default to workaround this. nrounds needs to be tuned by the user.
- nthread:
– Actual value: Undefined, triggering auto-detection of the number of CPUs.
– Adjusted value: 1.
– Reason for change: Conflicting with parallelization via future.

• verbose:
  – Actual default: 1.
  – Adjusted default: 0.
  – Reason for change: Reduce verbosity.

Super classes

\texttt{mlr3::Learner} \rightarrow \texttt{mlr3::LearnerRegr} \rightarrow \texttt{LearnerRegrXgboost}

Methods

\textbf{Public methods:}

• \texttt{LearnerRegrXgboost$new()}  
• \texttt{LearnerRegrXgboost$importance()}  
• \texttt{LearnerRegrXgboost$clone()}

\textbf{Method} \texttt{new()}: Creates a new instance of this \texttt{R6} class.

Usage:
\texttt{LearnerRegrXgboost$new()}

\textbf{Method} \texttt{importance()}: The importance scores are calculated with \texttt{xgboost::xgb.importance()}.

Usage:
\texttt{LearnerRegrXgboost$importance()}

Returns: Named numeric().

\textbf{Method} \texttt{clone()}: The objects of this class are cloneable with this method.

Usage:
\texttt{LearnerRegrXgboost$clone(deep = FALSE)}

Arguments:

deep  Whether to make a deep clone.

Note

To compute on GPUs, you first need to compile \texttt{xgboost} yourself and link against CUDA. See https://xgboost.readthedocs.io/en/stable/build.html#building-with-gpu-support.

References

See Also

- Package mlr3extralearners for more learners.
- Dictionary of Learners: mlr_learners
- as.data.table(mlr_learners) for a table of available Learners in the running session (depending on the loaded packages).
- mlr3pipelines to combine learners with pre- and postprocessing steps.
- Extension packages for additional task types:
  - mlr3proba for probabilistic supervised regression and survival analysis.
  - mlr3cluster for unsupervised clustering.
- mlr3tuning for tuning of hyperparameters, mlr3tuningspaces for established default tuning spaces.


Examples

```r
## Not run:
if (requireNamespace("xgboost", quietly = TRUE)) {
  # Define the Learner and set parameter values
  learner = lrn("regr.xgboost")
  print(learner)

  # Define a Task
  task = tsk("mtcars")

  # Create train and test set
  ids = partition(task)

  # Train the learner on the training ids
  learner$train(task, row_ids = ids$train)

  # print the model
  print(learner$model)

  # importance method
  if("importance" %in% learner$properties) print(learner$importance)

  # Make predictions for the test rows
  predictions = learner$predict(task, row_ids = ids$test)

  # Score the predictions
  predictions$score()
}
```
## Not run:
# Train learner with early stopping on spam data set

```r
task = tsk("mtcars")
# Split task into training and test set
split = partition(task, ratio = 0.8)
task$set_row_roles(split$test, "test")

# Set early stopping parameter
learner = lrn("regr.xgboost",
   nrounds = 100,
   early_stopping_rounds = 10,
   early_stopping_set = "test")
)

# Train learner with early stopping
learner$train(task)
```

## End(Not run)
## Index

### *Learner*

<table>
<thead>
<tr>
<th>Learner</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mlr_learners_classif.cv_glmnet</td>
<td>3</td>
</tr>
<tr>
<td>mlr_learners_classif.glmnet</td>
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</tr>
<tr>
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<td>15</td>
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<tr>
<td>mlr_learners_classif.multinom</td>
<td>18</td>
</tr>
<tr>
<td>mlr_learners_classif.naive_bayes</td>
<td>21</td>
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<td>mlr_learners_classif.nnet</td>
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<tr>
<td>mlr_learners_classif.ranger</td>
<td>29</td>
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<tr>
<td>mlr_learners_classif.svm</td>
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<td>mlr_learners_classif.xgboost</td>
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<td>mlr_learners_regr.cv_glmnet</td>
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<td>mlr_learners_regr.glmnet</td>
<td>43</td>
</tr>
<tr>
<td>mlr_learners_regr.kknn</td>
<td>47, 48</td>
</tr>
<tr>
<td>mlr_learners_regr.km</td>
<td>50</td>
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<td>mlr_learners_regr.lm</td>
<td>53</td>
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<td>mlr_learners_regr.nnet</td>
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<td>58</td>
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<td>62</td>
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<tr>
<td>mlr_learners_regr.xgboost</td>
<td>64</td>
</tr>
</tbody>
</table>

| contr.poly()                                 | 17, 54  |
| contr.treatment()                            | 17, 54  |

| DiceKriging::km()                            | 50      |

| Dictionary                                   | 5, 9, 12, 14, 17, 20, 22, 25, 28, 31, 34, 38, 42, 46, 49, 52, 54, 57, 61, 63, 68 |
| dictionary                                   | 3, 7, 10, 13, 16, 19, 21, 24, 26, 29, 32, 36, 40, 44, 47, 50, 53, 56, 58, 62, 64 |

| e1071::naiveBayes()                          | 21      |
| e1071::svm()                                 | 32, 62  |

| glmnet::cv.glmnet()                          | 3, 7, 40, 43 |
| glmnet::glmnet()                             | 7, 43     |

| glmnet::predict.glmnet()                     | 5, 9, 41, 45 |

| kknn::knn()                                  | 10–12, 47, 48 |

| Learner                                      | 3, 7, 10, 13, 16, 19, 21, 24, 26, 29, 32, 35, 36, 40, 44, 47, 50, 53, 56, 58, 62, 64 |

| LearnerClassifCVGlmnet                       | mlr_learners_classif.cv_glmnet, 3 |
| LearnerClassifGlmnet                         | mlr_learners_classif.glmnet, 6 |
| LearnerClassifKKNN                           | mlr_learners_classif.kknn, 10 |
| LearnerClassifLDA                            | mlr_learners_classif.lda, 13 |
| LearnerClassifLogReg                         | mlr_learners_classif.log_reg, 15 |
| LearnerClassifMultinom                       | mlr_learners_classif.multinom, 18 |
| LearnerClassifNaiveBayes                     | mlr_learners_classif.naive_bayes, 21 |
| LearnerClassifNnet                           | mlr_learners_classif.nnet, 23 |
| LearnerClassifQDA                            | mlr_learners_classif.qda, 26 |
| LearnerClassifRanger                         | mlr_learners_classif.ranger, 29 |
| LearnerClassifSVM                            | mlr_learners_classif.svm, 32 |
| LearnerClassifXgboost                        | mlr_learners_classif.xgboost, 35 |
| LearnerRegrCVGlmnet                          | mlr_learners_regr.cv_glmnet, 40 |

| contr.poly()                                 | 17, 54  |
| contr.treatment()                            | 17, 54  |

| DiceKriging::km()                            | 50      |

| Dictionary                                   | 5, 9, 12, 14, 17, 20, 22, 25, 28, 31, 34, 38, 42, 46, 49, 52, 54, 57, 61, 63, 68 |
| dictionary                                   | 3, 7, 10, 13, 16, 19, 21, 24, 26, 29, 32, 36, 40, 44, 47, 50, 53, 56, 58, 62, 64 |

| e1071::naiveBayes()                          | 21      |
| e1071::svm()                                 | 32, 62  |

| glmnet::cv.glmnet()                          | 3, 7, 40, 43 |
| glmnet::glmnet()                             | 7, 43     |
mlr_learners_regr.svm, 6, 9, 12, 15, 18, 20, 23, 25, 28, 31, 34, 38, 42, 46, 49, 52, 55, 57, 61, 62, 68
mlr_learners_regr.xgboost, 6, 9, 12, 15, 18, 20, 23, 25, 28, 31, 34, 38, 42, 46, 49, 52, 55, 57, 61, 63, 64
nnet::multinom(), 18
nnet::nnet.formula(), 23, 55
R6, 5, 8, 11, 14, 17, 20, 22, 25, 27, 30, 33, 38, 41, 45, 48, 51, 54, 57, 60, 63, 67
ranger::ranger(), 29, 58
stats::glm(), 5, 8, 15, 16
stats::lm(), 53
stats::logLik(), 17, 20, 54
xgboost::xgb.importance(), 38, 67
xgboost::xgb.train(), 35, 64