

Package ‘mlr3learners’

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Title Recommended Learners for ‘mlr3’

Version 0.8.0

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.

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URL <https://mlr3learners.mlr-org.com>,
<https://github.com/mlr-org/mlr3learners>

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

Depends mlr3 (>= 0.21.1), R (>= 3.1.0)

Imports checkmate, data.table, mlr3misc (>= 0.9.4), paradox (>= 1.0.0), R6

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

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Collate ‘aaa.R’ ‘LearnerClassifCVGlmnet.R’ ‘LearnerClassifGlmnet.R’
‘LearnerClassifKKN.R’ ‘LearnerClassifLDA.R’
‘LearnerClassifLogReg.R’ ‘LearnerClassifMultinom.R’
‘LearnerClassifNaiveBayes.R’ ‘LearnerClassifNnet.R’
‘LearnerClassifQDA.R’ ‘LearnerClassifRanger.R’
‘LearnerClassifSVM.R’ ‘LearnerClassifXgboost.R’
‘LearnerRegrCVGlmnet.R’ ‘LearnerRegrGlmnet.R’
‘LearnerRegrKKN.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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mlr3learners-package *mlr3learners: Recommended Learners for 'mlr3'*

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>. Feel invited to contribute a missing learner to the **mlr3** ecosystem!

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See Also

Useful links:

- <https://mlr3learners.ml-org.com>
- <https://github.com/mlr-org/mlr3learners>
- Report bugs at <https://github.com/mlr-org/mlr3learners/issues>

mlr_learners_classif.cv_glmnet

GLM with Elastic Net Regularization Classification Learner

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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```
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**

Parameters

Id	Type	Default	Levels	Range
alignment	character	lambda	lambda, fraction	-
alpha	numeric	1		[0, 1]
big	numeric	9.9e+35		$(-\infty, \infty)$
devmax	numeric	0.999		[0, 1]
dfmax	integer	-		[0, ∞)
epsnr	numeric	1e-08		[0, 1]
eps	numeric	1e-06		[0, 1]
exclude	integer	-		[1, ∞)
exmx	numeric	250		$(-\infty, \infty)$
fdev	numeric	1e-05		[0, 1]
foldid	untyped	NULL		-
gamma	untyped	-		-
grouped	logical	TRUE	TRUE, FALSE	-
intercept	logical	TRUE	TRUE, FALSE	-
keep	logical	FALSE	TRUE, FALSE	-
lambda.min.ratio	numeric	-		[0, 1]
lambda	untyped	-		-
lower.limits	untyped	-		-
maxit	integer	100000		[1, ∞)
mnlam	integer	5		[1, ∞)
mxitr	integer	25		[1, ∞)
mxit	integer	100		[1, ∞)
nfolds	integer	10		[3, ∞)
nlambda	integer	100		[1, ∞)
offset	untyped	NULL		-
parallel	logical	FALSE	TRUE, FALSE	-
penalty.factor	untyped	-		-
pmax	integer	-		[0, ∞)
pmin	numeric	1e-09		[0, 1]
prec	numeric	1e-10		$(-\infty, \infty)$
predict.gamma	numeric	gamma.1se		$(-\infty, \infty)$
relax	logical	FALSE	TRUE, FALSE	-
s	numeric	lambda.1se		[0, ∞)
standardize	logical	TRUE	TRUE, FALSE	-
standardize.response	logical	FALSE	TRUE, FALSE	-
thresh	numeric	1e-07		[0, ∞)
trace.it	integer	0		[0, 1]
type.gaussian	character	-	covariance, naive	-
type.logistic	character	-	Newton, modified.Newton	-
type.measure	character	deviance	deviance, class, auc, mse, mae	-
type.multinomial	character	-	ungrouped, grouped	-
upper.limits	untyped	-		-

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

Friedman J, Hastie T, Tibshirani R (2010). "Regularization Paths for Generalized Linear Models via Coordinate Descent." *Journal of Statistical Software*, **33**(1), 1–22. doi:10.18637/jss.v033.i01.

See Also

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- Dictionary of Learners: [mlr3::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.

Other Learner: `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.ranger`, `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

```
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

Description

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

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 **mlr3tuning**). When `lambda` is tuned, the `glmnet` will be trained for each tuning iteration. While fitting the whole path of `lambda`s 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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

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

Meta Information

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

Parameters

Id	Type	Default	Levels	Range
alpha	numeric	1		[0, 1]
big	numeric	9.9e+35		$(-\infty, \infty)$
devmax	numeric	0.999		[0, 1]
dfmax	integer	-		[0, ∞)
eps	numeric	1e-06		[0, 1]
epsnr	numeric	1e-08		[0, 1]
exact	logical	FALSE	TRUE, FALSE	-
exclude	integer	-		[1, ∞)
exmx	numeric	250		$(-\infty, \infty)$
fdev	numeric	1e-05		[0, 1]

gamma	numeric	1		$(-\infty, \infty)$
intercept	logical	TRUE	TRUE, FALSE	-
lambda	untyped	-		-
lambda.min.ratio	numeric	-		$[0, 1]$
lower.limits	untyped	-		-
maxit	integer	100000		$[1, \infty)$
mnlam	integer	5		$[1, \infty)$
mxit	integer	100		$[1, \infty)$
mxitr	integer	25		$[1, \infty)$
nlambda	integer	100		$[1, \infty)$
newoffset	untyped	-		-
offset	untyped	NULL		-
penalty.factor	untyped	-		-
pmax	integer	-		$[0, \infty)$
pmin	numeric	1e-09		$[0, 1]$
prec	numeric	1e-10		$(-\infty, \infty)$
relax	logical	FALSE	TRUE, FALSE	-
s	numeric	0.01		$[0, \infty)$
standardize	logical	TRUE	TRUE, FALSE	-
standardize.response	logical	FALSE	TRUE, FALSE	-
thresh	numeric	1e-07		$[0, \infty)$
trace.it	integer	0		$[0, 1]$
type.gaussian	character	-	covariance, naive	-
type.logistic	character	-	Newton, modified.Newton	-
type.multinomial	character	-	ungrouped, grouped	-
upper.limits	untyped	-		-

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

Friedman J, Hastie T, Tibshirani R (2010). "Regularization Paths for Generalized Linear Models via Coordinate Descent." *Journal of Statistical Software*, **33**(1), 1–22. doi:10.18637/jss.v033.i01.

See Also

- Chapter in the [mlr3book](https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners): https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package [mlr3extralearners](#) for more learners.
- [Dictionary of Learners: mlr3::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, [mlr3tuningpaces](#) for established default tuning spaces.

Other Learner: [mlr_learners_classif.cv_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.ranger](#), [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

```

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 `kknn::kknn()` from package **kknn**.

Initial parameter values

- `store_model`:
– See note.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```

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

```

Meta Information

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

Parameters

Id	Type	Default	Levels
k	integer	7	
distance	numeric	2	
kernel	character	optimal	rectangular, triangular, epanechnikov, biweight, triweight, cos, inv, gaussian, rank, optimal
scale	logical	TRUE	TRUE, FALSE
ykernel	untyped	NULL	
store_model	logical	FALSE	TRUE, FALSE

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()`.

- 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

Hechenbichler, Klaus, Schliep, Klaus (2004). “Weighted k-nearest-neighbor techniques and ordinal classification.” Technical Report Discussion Paper 399, SFB 386, Ludwig-Maximilians University Munich. doi:10.5282/ubm/epub.1769.

Samworth, J R (2012). “Optimal weighted nearest neighbour classifiers.” *The Annals of Statistics*, **40**(5), 2733–2763. doi:10.1214/12AOS1049.

Cover, Thomas, Hart, Peter (1967). “Nearest neighbor pattern classification.” *IEEE transactions on information theory*, **13**(1), 21–27. doi:10.1109/TIT.1967.1053964.

See Also

- Chapter in the `mlr3book`: https://mlr3book.ml-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package `mlr3extralearners` for more learners.
- Dictionary of Learners: `mlr3::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.

Other Learner: `mlr_learners_classif.cv_glmnet`, `mlr_learners_classif.glmnet`, `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.ranger`, `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

```
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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::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	Type	Default	Levels	Range
dimen	untyped	-		-
method	character	moment	moment, mle, mve, t	-
nu	integer	-		$(-\infty, \infty)$
predict.method	character	plug-in	plug-in, predictive, debiased	-
predict.prior	untyped	-		-
prior	untyped	-		-
tol	numeric	-		$(-\infty, \infty)$

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

Venables WN, Ripley BD (2002). *Modern Applied Statistics with S*, Fourth edition. Springer, New York. ISBN 0-387-95457-0, <http://www.stats.ox.ac.uk/pub/MASS4/>.

See Also

- Chapter in the `mlr3book`: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package `mlr3extralearners` for more learners.
- Dictionary of Learners: `mlr3::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.

Other Learner: `mlr_learners_classif.cv_glmnet`, `mlr_learners_classif.glmnet`, `mlr_learners_classif.kknn`, `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.ranger`, `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

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

Logistic Regression Classification Learner

Description

Classification via logistic regression. Calls `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.

Initial parameter values

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

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

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

Id	Type	Default	Levels	Range
dispersion	untyped	NULL		-
epsilon	numeric	1e-08		$(-\infty, \infty)$
etastart	untyped	-		-
maxit	numeric	25		$(-\infty, \infty)$
model	logical	TRUE	TRUE, FALSE	-
mustart	untyped	-		-
offset	untyped	-		-
singular.ok	logical	TRUE	TRUE, FALSE	-
start	untyped	NULL		-
trace	logical	FALSE	TRUE, FALSE	-
x	logical	FALSE	TRUE, FALSE	-
y	logical	TRUE	TRUE, FALSE	-

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

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- Dictionary of Learners: `mlr3::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.

Other Learner: `mlr_learners_classif.cv_glmnet`, `mlr_learners_classif.glmnet`, `mlr_learners_classif.kknn`, `mlr_learners_classif.lda`, `mlr_learners_classif.multinom`, `mlr_learners_classif.naive_bayes`, `mlr_learners_classif.nnet`, `mlr_learners_classif.qda`, `mlr_learners_classif.ranger`, `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

```
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

Multinomial log-linear models via neural networks. Calls `nnet::multinom()` from package **nnet**.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```
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

Id	Type	Default	Levels	Range
Hess	logical	FALSE	TRUE, FALSE	-
abstol	numeric	1e-04		$(-\infty, \infty)$
censored	logical	FALSE	TRUE, FALSE	-
decay	numeric	0		$(-\infty, \infty)$
entropy	logical	FALSE	TRUE, FALSE	-
mask	untyped	-		-
maxit	integer	100		$[1, \infty)$
MaxNWts	integer	1000		$[1, \infty)$
model	logical	FALSE	TRUE, FALSE	-
linout	logical	FALSE	TRUE, FALSE	-
rang	numeric	0.7		$(-\infty, \infty)$
reitol	numeric	1e-08		$(-\infty, \infty)$
size	integer	-		$[1, \infty)$
skip	logical	FALSE	TRUE, FALSE	-
softmax	logical	FALSE	TRUE, FALSE	-
summ	character	0	0, 1, 2, 3	-
trace	logical	TRUE	TRUE, FALSE	-
Wts	untyped	-		-

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:

`deep` Whether to make a deep clone.

See Also

- Chapter in the [mlr3book](https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners): https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package [mlr3extralearners](#) for more learners.
- [Dictionary of Learners](#): [mlr3::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.

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.naive_bayes](#), [mlr_learners_classif.nnet](#), [mlr_learners_classif.qda](#), [mlr_learners_classif.ranger](#), [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

```

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

Naive Bayes Classification Learner

Description

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

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```

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

Id	Type	Default	Range
eps	numeric	0	$(-\infty, \infty)$
laplace	numeric	0	$[0, \infty)$
threshold	numeric	0.001	$(-\infty, \infty)$

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:

`deep` Whether to make a deep clone.

See Also

- Chapter in the `mlr3book`: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package `mlr3extralearners` for more learners.
- [Dictionary of Learners: mlr3::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.

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.nnet`, `mlr_learners_classif.qda`, `mlr_learners_classif.ranger`, `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

```
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 **mlr3torch**.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::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

Id	Type	Default	Levels	Range
Hess	logical	FALSE	TRUE, FALSE	-
MaxNWts	integer	1000		[1, ∞)
Wts	untyped	-		-
abstol	numeric	1e-04		(-∞, ∞)
censored	logical	FALSE	TRUE, FALSE	-
contrasts	untyped	NULL		-
decay	numeric	0		(-∞, ∞)
mask	untyped	-		-
maxit	integer	100		[1, ∞)
na.action	untyped	-		-
rang	numeric	0.7		(-∞, ∞)
reitol	numeric	1e-08		(-∞, ∞)
size	integer	3		[0, ∞)
skip	logical	FALSE	TRUE, FALSE	-
subset	untyped	-		-
trace	logical	TRUE	TRUE, FALSE	-
formula	untyped	-		-

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:

`deep` Whether to make a deep clone.

References

Ripley BD (1996). *Pattern Recognition and Neural Networks*. Cambridge University Press. doi:10.1017/cbo9780511812651.

See Also

- Chapter in the `mlr3book`: https://mlr3book.ml-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package `mlr3extralearners` for more learners.
- Dictionary of Learners: `mlr3::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, `mlr3tuningpaces` 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.qda`, `mlr_learners_classif.ranger`, `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

```

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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```

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

Id	Type	Default	Levels	Range
method	character	moment	moment, mle, mve, t	-
nu	integer	-		$(-\infty, \infty)$
predict.method	character	plug-in	plug-in, predictive, debiased	-
predict.prior	untyped	-		-
prior	untyped	-		-

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:

`deep` Whether to make a deep clone.

References

Venables WN, Ripley BD (2002). *Modern Applied Statistics with S*, Fourth edition. Springer, New York. ISBN 0-387-95457-0, <http://www.stats.ox.ac.uk/pub/MASS4/>.

See Also

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: [mlr3::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.

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.ranger`, `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

```
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()
}
```

mlr_learners_classif.ranger
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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```
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

Id	Type	Default	Levels	Range
<code>alpha</code>	numeric	0.5		$(-\infty, \infty)$
<code>always.split.variables</code>	untyped	-		-
<code>class.weights</code>	untyped	NULL		-
<code>holdout</code>	logical	FALSE	TRUE, FALSE	-
<code>importance</code>	character	-	none, impurity, impurity_corrected, permutation	-

keep.inbag	logical	FALSE	TRUE, FALSE	-
max.depth	integer	NULL		$[0, \infty)$
min.bucket	integer	1		$[1, \infty)$
min.node.size	integer	NULL		$[1, \infty)$
minprop	numeric	0.1		$(-\infty, \infty)$
mtry	integer	-		$[1, \infty)$
mtry.ratio	numeric	-		$[0, 1]$
num.random.splits	integer	1		$[1, \infty)$
node.stats	logical	FALSE	TRUE, FALSE	-
num.threads	integer	1		$[1, \infty)$
num.trees	integer	500		$[1, \infty)$
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		$(-\infty, \infty)$
split.select.weights	untyped	NULL		-
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:

```
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"

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

Wright, N. M, Ziegler, Andreas (2017). “ranger: A Fast Implementation of Random Forests for High Dimensional Data in C++ and R.” *Journal of Statistical Software*, **77**(1), 1–17. doi:10.18637/jss.v077.i01.

Breiman, Leo (2001). “Random Forests.” *Machine Learning*, **45**(1), 5–32. ISSN 1573-0565, doi:10.1023/A:1010933404324.

See Also

- Chapter in the **mlr3book**: https://mlr3book.ml-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- Dictionary of Learners: **mlr3::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.

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

```

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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```

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

Id	Type	Default	Levels	Range
cacheSize	numeric	40		$(-\infty, \infty)$
class.weights	untyped	NULL		-
coef0	numeric	0		$(-\infty, \infty)$
cost	numeric	1		$[0, \infty)$
cross	integer	0		$[0, \infty)$
decision.values	logical	FALSE	TRUE, FALSE	-
degree	integer	3		$[1, \infty)$
epsilon	numeric	0.1		$[0, \infty)$
fitted	logical	TRUE	TRUE, FALSE	-
gamma	numeric	-		$[0, \infty)$
kernel	character	radial	linear, polynomial, radial, sigmoid	-
nu	numeric	0.5		$(-\infty, \infty)$
scale	untyped	TRUE		-
shrinking	logical	TRUE	TRUE, FALSE	-
tolerance	numeric	0.001		$[0, \infty)$
type	character	C-classification	C-classification, nu-classification	-

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

Cortes, Corinna, Vapnik, Vladimir (1995). "Support-vector networks." *Machine Learning*, **20**(3), 273–297. doi:10.1007/BF00994018.

See Also

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: [mlr3::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.

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.ranger`, `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

```
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()
}
```

`mlr_learners_classif.xgboost`*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 `mlr3::Learner` in a `mlr3pipelines` `GraphLearner` as the preprocessing steps will not be applied to the data in the watchlist. See the section *Early Stopping and Validation* on how to do this.

Initial parameter values

- `nrounds`:
 - Actual default: no default.
 - Adjusted default: 1000.
 - Reason for change: Without a default construction of the learner would error. The `lightgbm` learner has a default of 1000, so we use the same here.
- `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 and Validation

In order to monitor the validation performance during the training, you can set the `$validate` field of the Learner. For information on how to configure the validation set, see the *Validation* section of `mlr3::Learner`. This validation data can also be used for early stopping, which can be enabled by setting the `early_stopping_rounds` parameter. The final (or in the case of early stopping best) validation scores can be accessed via `$internal_valid_scores`, and the optimal `nrounds` via `$internal_tuned_values`. The internal validation measure can be set via the `eval_metric` parameter that can be a `mlr3::Measure`, a function, or a character string for the internal `xgboost` measures. Using an `mlr3::Measure` is slower than the internal `xgboost` measures, but allows to use the same measure for tuning and validation.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```
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

Id	Type	Default	Levels	Range
alpha	numeric	0		[0, ∞)
approxcontrib	logical	FALSE	TRUE, FALSE	-
base_score	numeric	0.5		(-∞, ∞)
booster	character	gbtree	gbtree, gblinear, dart	-
callbacks	untyped	list()		-
colsample_bylevel	numeric	1		[0, 1]
colsample_bynode	numeric	1		[0, 1]
colsample_bytree	numeric	1		[0, 1]
device	untyped	"cpu"		-
disable_default_eval_metric	logical	FALSE	TRUE, FALSE	-
early_stopping_rounds	integer	NULL		[1, ∞)
eta	numeric	0.3		[0, 1]
eval_metric	untyped	-		-
feature_selector	character	cyclic	cyclic, shuffle, random, greedy, thrifty	-
gamma	numeric	0		[0, ∞)
grow_policy	character	depthwise	depthwise, lossguide	-
interaction_constraints	untyped	-		-
iterationrange	untyped	-		-
lambda	numeric	1		[0, ∞)
lambda_bias	numeric	0		[0, ∞)
max_bin	integer	256		[2, ∞)
max_delta_step	numeric	0		[0, ∞)
max_depth	integer	6		[0, ∞)
max_leaves	integer	0		[0, ∞)
maximize	logical	NULL	TRUE, FALSE	-
min_child_weight	numeric	1		[0, ∞)
missing	numeric	NA		(-∞, ∞)
monotone_constraints	untyped	0		-
nrounds	integer	-		[1, ∞)
normalize_type	character	tree	tree, forest	-

nthread	integer	1		[1, ∞)
ntreelimit	integer	NULL		[1, ∞)
num_parallel_tree	integer	1		[1, ∞)
objective	untyped	"binary:logistic"		-
one_drop	logical	FALSE	TRUE, FALSE	-
outputmargin	logical	FALSE	TRUE, FALSE	-
predcontrib	logical	FALSE	TRUE, FALSE	-
predinteraction	logical	FALSE	TRUE, FALSE	-
predleaf	logical	FALSE	TRUE, FALSE	-
print_every_n	integer	1		[1, ∞)
process_type	character	default	default, update	-
rate_drop	numeric	0		[0, 1]
refresh_leaf	logical	TRUE	TRUE, FALSE	-
reshape	logical	FALSE	TRUE, FALSE	-
seed_per_iteration	logical	FALSE	TRUE, FALSE	-
sampling_method	character	uniform	uniform, gradient_based	-
sample_type	character	uniform	uniform, weighted	-
save_name	untyped	NULL		-
save_period	integer	NULL		[0, ∞)
scale_pos_weight	numeric	1		(-∞, ∞)
skip_drop	numeric	0		[0, 1]
strict_shape	logical	FALSE	TRUE, FALSE	-
subsample	numeric	1		[0, 1]
top_k	integer	0		[0, ∞)
training	logical	FALSE	TRUE, FALSE	-
tree_method	character	auto	auto, exact, approx, hist, gpu_hist	-
tweedie_variance_power	numeric	1.5		[1, 2]
updater	untyped	-		-
verbose	integer	1		[0, 2]
watchlist	untyped	NULL		-
xgb_model	untyped	NULL		-

Super classes

`mlr3::Learner` -> `mlr3::LearnerClassif` -> `LearnerClassifXgboost`

Active bindings

`internal_valid_scores` (named `list()` or `NULL`) The validation scores extracted from `model$evaluation_log`.

If early stopping is activated, this contains the validation scores of the model for the optimal rounds, otherwise the rounds for the final model.

`internal_tuned_values` (named `list()` or `NULL`) If early stopping is activated, this returns a list with rounds, which is extracted from `$best_iteration` of the model and otherwise `NULL`.

`validate` (`numeric(1)` or `character(1)` or `NULL`) How to construct the internal validation data. This parameter can be either `NULL`, a ratio, "test", or "predefined".

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

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

References

Chen, Tianqi, Guestrin, Carlos (2016). “Xgboost: A scalable tree boosting system.” In *Proceedings of the 22nd ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, 785–794. ACM. doi:10.1145/2939672.2939785.

See Also

- Chapter in the [mlr3book](https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners): https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package [mlr3extralearners](#) for more learners.
- [Dictionary of Learners](#): [mlr3::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.

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.ranger`, `mlr_learners_classif.svm`, `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

```
## 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")

# use 30 percent for validation
# Set early stopping parameter
learner = lrn("classif.xgboost",
  nrounds = 100,
  early_stopping_rounds = 10,
  validate = 0.3
)
```

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

# Inspect optimal rounds and validation performance
learner$internal_tuned_values
learner$internal_valid_scores

## End(Not run)
```

```
mlr_learners_regr.cv_glmnet
```

GLM with Elastic Net Regularization Regression Learner

Description

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

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

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

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

Meta Information

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

Parameters

Id	Type	Default	Levels	Range
alignment	character	lambda	lambda, fraction	-
alpha	numeric	1		[0, 1]
big	numeric	9.9e+35		$(-\infty, \infty)$
devmax	numeric	0.999		[0, 1]
dfmax	integer	-		[0, ∞)
eps	numeric	1e-06		[0, 1]
epsnr	numeric	1e-08		[0, 1]
exclude	integer	-		[1, ∞)

exmx	numeric	250		$(-\infty, \infty)$
family	character	gaussian	gaussian, poisson	-
fdev	numeric	1e-05		[0, 1]
foldid	untyped	NULL		-
gamma	untyped	-		-
grouped	logical	TRUE	TRUE, FALSE	-
intercept	logical	TRUE	TRUE, FALSE	-
keep	logical	FALSE	TRUE, FALSE	-
lambda	untyped	-		-
lambda.min.ratio	numeric	-		[0, 1]
lower.limits	untyped	-		-
maxit	integer	100000		[1, ∞)
mnlam	integer	5		[1, ∞)
mxit	integer	100		[1, ∞)
mxitnr	integer	25		[1, ∞)
nfolds	integer	10		[3, ∞)
nlambda	integer	100		[1, ∞)
offset	untyped	NULL		-
parallel	logical	FALSE	TRUE, FALSE	-
penalty.factor	untyped	-		-
pmax	integer	-		[0, ∞)
pmin	numeric	1e-09		[0, 1]
prec	numeric	1e-10		$(-\infty, \infty)$
predict.gamma	numeric	gamma.1se		$(-\infty, \infty)$
relax	logical	FALSE	TRUE, FALSE	-
s	numeric	lambda.1se		[0, ∞)
standardize	logical	TRUE	TRUE, FALSE	-
standardize.response	logical	FALSE	TRUE, FALSE	-
thresh	numeric	1e-07		[0, ∞)
trace.it	integer	0		[0, 1]
type.gaussian	character	-	covariance, naive	-
type.logistic	character	-	Newton, modified.Newton	-
type.measure	character	deviance	deviance, class, auc, mse, mae	-
type.multinomial	character	-	ungrouped, grouped	-
upper.limits	untyped	-		-

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:

```
LearnerRegrCVGlmnet$new()
```

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

Usage:

```
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

Friedman J, Hastie T, Tibshirani R (2010). "Regularization Paths for Generalized Linear Models via Coordinate Descent." *Journal of Statistical Software*, **33**(1), 1–22. doi:10.18637/jss.v033.i01.

See Also

- Chapter in the [mlr3book](https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners): https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package [mlr3extralearners](#) for more learners.
- [Dictionary of Learners: mlr3::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.

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.ranger](#), [mlr_learners_classif.svm](#), [mlr_learners_classif.xgboost](#), [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

```

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

GLM with Elastic Net Regularization Regression Learner

Description

Generalized linear models with elastic net regularization. Calls `glmnet::glmnet()` from package **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 **mlr3tuning**). When `lambda` is tuned, the `glmnet` will be trained for each tuning iteration. While fitting the whole path of `lambda`s 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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```
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**

Parameters

Id	Type	Default	Levels	Range
alignment	character	lambda	lambda, fraction	-
alpha	numeric	1		[0, 1]
big	numeric	9.9e+35		$(-\infty, \infty)$
devmax	numeric	0.999		[0, 1]
dfmax	integer	-		[0, ∞)
eps	numeric	1e-06		[0, 1]
epsnr	numeric	1e-08		[0, 1]
exact	logical	FALSE	TRUE, FALSE	-
exclude	integer	-		[1, ∞)
exmx	numeric	250		$(-\infty, \infty)$
family	character	gaussian	gaussian, poisson	-
fdev	numeric	1e-05		[0, 1]
gamma	numeric	1		$(-\infty, \infty)$
grouped	logical	TRUE	TRUE, FALSE	-
intercept	logical	TRUE	TRUE, FALSE	-
keep	logical	FALSE	TRUE, FALSE	-
lambda	untyped	-		-
lambda.min.ratio	numeric	-		[0, 1]
lower.limits	untyped	-		-
maxit	integer	100000		[1, ∞)
mnlam	integer	5		[1, ∞)
mxit	integer	100		[1, ∞)
mxitnr	integer	25		[1, ∞)

newoffset	untyped	-	-	-
nlambda	integer	100		$[1, \infty)$
offset	untyped	NULL		-
parallel	logical	FALSE	TRUE, FALSE	-
penalty.factor	untyped	-		-
pmax	integer	-		$[0, \infty)$
pmin	numeric	1e-09		$[0, 1]$
prec	numeric	1e-10		$(-\infty, \infty)$
relax	logical	FALSE	TRUE, FALSE	-
s	numeric	0.01		$[0, \infty)$
standardize	logical	TRUE	TRUE, FALSE	-
standardize.response	logical	FALSE	TRUE, FALSE	-
thresh	numeric	1e-07		$[0, \infty)$
trace.it	integer	0		$[0, 1]$
type.gaussian	character	-	covariance, naive	-
type.logistic	character	-	Newton, modified.Newton	-
type.multinomial	character	-	ungrouped, grouped	-
upper.limits	untyped	-		-

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

Friedman J, Hastie T, Tibshirani R (2010). “Regularization Paths for Generalized Linear Models via Coordinate Descent.” *Journal of Statistical Software*, **33**(1), 1–22. doi:10.18637/jss.v033.i01.

See Also

- Chapter in the **mlr3book**: https://mlr3book.ml-r.org/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: [mlr3::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.

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.ranger`, `mlr_learners_classif.svm`, `mlr_learners_classif.xgboost`, `mlr_learners_regr.cv_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

```
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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::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

Id	Type	Default	Levels
k	integer	7	
distance	numeric	2	
kernel	character	optimal	rectangular, triangular, epanechnikov, biweight, triweight, cos, inv, gaussian, rank, optim
scale	logical	TRUE	TRUE, FALSE
ykernel	untyped	NULL	
store_model	logical	FALSE	TRUE, FALSE

Super classes

`mlr3::Learner` -> `mlr3::LearnerRegr` -> `LearnerRegrKknn`

Methods**Public methods:**

- `LearnerRegrKknn$new()`
- `LearnerRegrKknn$clone()`

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

Usage:

`LearnerRegrKknn$new()`

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

Usage:

`LearnerRegrKknn$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 `$predict()`.
- `data`: Training data for calling `kknn::kknn()` during `$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

- Hechenbichler, Klaus, Schliep, Klaus (2004). “Weighted k-nearest-neighbor techniques and ordinal classification.” Technical Report Discussion Paper 399, SFB 386, Ludwig-Maximilians University Munich. doi:10.5282/ubm/epub.1769.
- Samworth, J R (2012). “Optimal weighted nearest neighbour classifiers.” *The Annals of Statistics*, **40**(5), 2733–2763. doi:10.1214/12AOS1049.
- Cover, Thomas, Hart, Peter (1967). “Nearest neighbor pattern classification.” *IEEE transactions on information theory*, **13**(1), 21–27. doi:10.1109/TIT.1967.1053964.

See Also

- Chapter in the **mlr3book**: https://mlr3book.ml-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: `mlr3::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.

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.ranger`, `mlr_learners_classif.svm`, `mlr_learners_classif.xgboost`, `mlr_learners_regr.cv_glmnet`, `mlr_learners_regr.glmnet`, `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

```
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()
}

```

mlr_learners_regr.km *Kriging Regression Learner*

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 $N(0, [jitter])$ -distributed noise to the data before prediction to avoid perfect interpolation. We recommend a value of $1e-12$.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```

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

Id	Type	Default	Levels	Range
bias.correct	logical	FALSE	TRUE, FALSE	-
checkNames	logical	TRUE	TRUE, FALSE	-
coef.cov	untyped	NULL		-
coef.trend	untyped	NULL		-
coef.var	untyped	NULL		-
control	untyped	NULL		-
cov.compute	logical	TRUE	TRUE, FALSE	-
covtype	character	matern5_2	gauss, matern5_2, matern3_2, exp, powexp	-
estim.method	character	MLE	MLE, LOO	-
gr	logical	TRUE	TRUE, FALSE	-
iso	logical	FALSE	TRUE, FALSE	-
jitter	numeric	0		$[0, \infty)$
kernel	untyped	NULL		-
knots	untyped	NULL		-
light.return	logical	FALSE	TRUE, FALSE	-
lower	untyped	NULL		-
multistart	integer	1		$(-\infty, \infty)$
noise.var	untyped	NULL		-
nugget	numeric	-		$(-\infty, \infty)$
nugget.estim	logical	FALSE	TRUE, FALSE	-
nugget.stability	numeric	0		$[0, \infty)$
optim.method	character	BFGS	BFGS, gen	-
parinit	untyped	NULL		-
penalty	untyped	NULL		-
scaling	logical	FALSE	TRUE, FALSE	-
se.compute	logical	TRUE	TRUE, FALSE	-
type	character	SK	SK, UK	-
upper	untyped	NULL		-

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:

`deep` Whether to make a deep clone.

References

Roustant O, Ginsbourger D, Deville Y (2012). “DiceKriging, DiceOptim: Two R Packages for the Analysis of Computer Experiments by Kriging-Based Metamodeling and Optimization.” *Journal of Statistical Software*, **51**(1), 1–55. doi:10.18637/jss.v051.i01.

See Also

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: `mlr3::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, **mlr3tuningpaces** 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.ranger`, `mlr_learners_classif.svm`, `mlr_learners_classif.xgboost`, `mlr_learners_regr.cv_glmnet`, `mlr_learners_regr.glmnet`, `mlr_learners_regr.kknn`, `mlr_learners_regr.lm`, `mlr_learners_regr.nnet`, `mlr_learners_regr.ranger`, `mlr_learners_regr.svm`, `mlr_learners_regr.xgboost`

Examples

```
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()
}

```

mlr_learners_regr.lm *Linear Model Regression Learner*

Description

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

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```

mlr_learners$get("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

Id	Type	Default	Levels	Range
df	numeric	Inf		$(-\infty, \infty)$
interval	character	-	none, confidence, prediction	-
level	numeric	0.95		$(-\infty, \infty)$
model	logical	TRUE	TRUE, FALSE	-
offset	logical	-	TRUE, FALSE	-
pred.var	untyped	-		-

qr	logical	TRUE	TRUE, FALSE	-
scale	numeric	NULL		$(-\infty, \infty)$
singular.ok	logical	TRUE	TRUE, FALSE	-
x	logical	FALSE	TRUE, FALSE	-
y	logical	FALSE	TRUE, FALSE	-
rankdeficient	character	-	warnif, simple, non-estim, NA, NAwarn	-
tol	numeric	1e-07		$(-\infty, \infty)$
verbose	logical	FALSE	TRUE, FALSE	-

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

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: [mlr3::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.

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.ranger`, `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.nnet`, `mlr_learners_regr.ranger`, `mlr_learners_regr.svm`, `mlr_learners_regr.xgboost`

Examples

```
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 **mlr3torch**.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

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

Meta Information

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

Parameters

Id	Type	Default	Levels	Range
Hess	logical	FALSE	TRUE, FALSE	-
MaxNWts	integer	1000		[1, ∞)
Wts	untyped	-		-
abstol	numeric	1e-04		$(-\infty, \infty)$
censored	logical	FALSE	TRUE, FALSE	-
contrasts	untyped	NULL		-
decay	numeric	0		$(-\infty, \infty)$
mask	untyped	-		-
maxit	integer	100		[1, ∞)
na.action	untyped	-		-
rang	numeric	0.7		$(-\infty, \infty)$
reitol	numeric	1e-08		$(-\infty, \infty)$
size	integer	3		[0, ∞)
skip	logical	FALSE	TRUE, FALSE	-
subset	untyped	-		-
trace	logical	TRUE	TRUE, FALSE	-
formula	untyped	-		-

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::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

Ripley BD (1996). *Pattern Recognition and Neural Networks*. Cambridge University Press. doi:10.1017/cbo9780511812651.

See Also

- Chapter in the [mlr3book](https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners): https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package [mlr3extralearners](#) for more learners.
- [Dictionary of Learners: mlr3::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.

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.ranger`, `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.ranger`, `mlr_learners_regr.svm`, `mlr_learners_regr.xgboost`

Examples

```
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 `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

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

Meta Information

- Task type: “regr”
- Predict Types: “response”, “se”, “quantiles”
- Feature Types: “logical”, “integer”, “numeric”, “character”, “factor”, “ordered”
- Required Packages: **mlr3**, **mlr3learners**, **ranger**

Parameters

Id	Type	Default	Levels	Range
alpha	numeric	0.5		$(-\infty, \infty)$
always.split.variables	untyped	-		-
holdout	logical	FALSE	TRUE, FALSE	-
importance	character	-	none, impurity, impurity_corrected, permutation	-
keep.inbag	logical	FALSE	TRUE, FALSE	-
max.depth	integer	NULL		$[0, \infty)$
min.bucket	integer	1		$[1, \infty)$
min.node.size	integer	5		$[1, \infty)$
minprop	numeric	0.1		$(-\infty, \infty)$
mtry	integer	-		$[1, \infty)$
mtry.ratio	numeric	-		$[0, 1]$
node.stats	logical	FALSE	TRUE, FALSE	-
num.random.splits	integer	1		$[1, \infty)$
num.threads	integer	1		$[1, \infty)$
num.trees	integer	500		$[1, \infty)$
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		$(-\infty, \infty)$
split.select.weights	untyped	NULL		-
splitrule	character	variance	variance, extratrees, maxstat	-
verbose	logical	TRUE	TRUE, FALSE	-
write.forest	logical	TRUE	TRUE, FALSE	-

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**.

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:

`deep` Whether to make a deep clone.

References

- Wright, N. M, Ziegler, Andreas (2017). “ranger: A Fast Implementation of Random Forests for High Dimensional Data in C++ and R.” *Journal of Statistical Software*, **77**(1), 1–17. doi:10.18637/jss.v077.i01.
- Breiman, Leo (2001). “Random Forests.” *Machine Learning*, **45**(1), 5–32. ISSN 1573-0565, doi:10.1023/A:1010933404324.

See Also

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: `mlr3::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.

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.ranger`, `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.svm`, `mlr_learners_regr.xgboost`

Examples

```
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()
}
```

mlr_learners_regr.svm *Support Vector Machine*

Description

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

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

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

Meta Information

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

Parameters

Id	Type	Default	Levels	Range
cacheSize	numeric	40		$(-\infty, \infty)$
coef0	numeric	0		$(-\infty, \infty)$
cost	numeric	1		$[0, \infty)$
cross	integer	0		$[0, \infty)$
degree	integer	3		$[1, \infty)$
epsilon	numeric	0.1		$[0, \infty)$
fitted	logical	TRUE	TRUE, FALSE	-
gamma	numeric	-		$[0, \infty)$
kernel	character	radial	linear, polynomial, radial, sigmoid	-
nu	numeric	0.5		$(-\infty, \infty)$
scale	untyped	TRUE		-

shrinking	logical	TRUE	TRUE, FALSE	-
tolerance	numeric	0.001		$[0, \infty)$
type	character	eps-regression	eps-regression, nu-regression	-

Super classes

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

`deep` Whether to make a deep clone.

References

Cortes, Corinna, Vapnik, Vladimir (1995). “Support-vector networks.” *Machine Learning*, **20**(3), 273–297. doi:10.1007/BF00994018.

See Also

- Chapter in the `mlr3book`: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package `mlr3extralearners` for more learners.
- [Dictionary of Learners: mlr3::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.

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.ranger`, `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.xgboost`

Examples

```
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

eXtreme Gradient Boosting regression. Calls `xgboost::xgb.train()` from package **xgboost**.

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

Note that using the `watchlist` parameter directly will lead to problems when wrapping this `mlr3::Learner` in a `mlr3pipelines` `GraphLearner` as the preprocessing steps will not be applied to the data in the `watchlist`. See the section *Early Stopping and Validation* on how to do this.

Dictionary

This `mlr3::Learner` can be instantiated via the dictionary `mlr3::mlr_learners` or with the associated sugar function `mlr3::lrn()`:

```
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

Id	Type	Default	Levels	Range
alpha	numeric	0		$[0, \infty)$
approxcontrib	logical	FALSE	TRUE, FALSE	-
base_score	numeric	0.5		$(-\infty, \infty)$
booster	character	gbtree	gbtree, gblinear, dart	-
callbacks	untyped	list()		-
colsample_bylevel	numeric	1		$[0, 1]$
colsample_bynode	numeric	1		$[0, 1]$
colsample_bytree	numeric	1		$[0, 1]$
device	untyped	"cpu"		-
disable_default_eval_metric	logical	FALSE	TRUE, FALSE	-
early_stopping_rounds	integer	NULL		$[1, \infty)$
eta	numeric	0.3		$[0, 1]$
eval_metric	untyped	"rmse"		-
feature_selector	character	cyclic	cyclic, shuffle, random, greedy, thrifty	-
gamma	numeric	0		$[0, \infty)$
grow_policy	character	depthwise	depthwise, lossguide	-
interaction_constraints	untyped	-		-
iterationrange	untyped	-		-
lambda	numeric	1		$[0, \infty)$
lambda_bias	numeric	0		$[0, \infty)$
max_bin	integer	256		$[2, \infty)$
max_delta_step	numeric	0		$[0, \infty)$
max_depth	integer	6		$[0, \infty)$
max_leaves	integer	0		$[0, \infty)$
maximize	logical	NULL	TRUE, FALSE	-
min_child_weight	numeric	1		$[0, \infty)$
missing	numeric	NA		$(-\infty, \infty)$
monotone_constraints	untyped	0		-
normalize_type	character	tree	tree, forest	-
nrounds	integer	-		$[1, \infty)$

nthread	integer	1		[1, ∞)
ntreelimit	integer	NULL		[1, ∞)
num_parallel_tree	integer	1		[1, ∞)
objective	untyped	"reg:squarederror"		-
one_drop	logical	FALSE	TRUE, FALSE	-
outputmargin	logical	FALSE	TRUE, FALSE	-
predcontrib	logical	FALSE	TRUE, FALSE	-
predinteraction	logical	FALSE	TRUE, FALSE	-
predleaf	logical	FALSE	TRUE, FALSE	-
print_every_n	integer	1		[1, ∞)
process_type	character	default	default, update	-
rate_drop	numeric	0		[0, 1]
refresh_leaf	logical	TRUE	TRUE, FALSE	-
reshape	logical	FALSE	TRUE, FALSE	-
sampling_method	character	uniform	uniform, gradient_based	-
sample_type	character	uniform	uniform, weighted	-
save_name	untyped	NULL		-
save_period	integer	NULL		[0, ∞)
scale_pos_weight	numeric	1		(-∞, ∞)
seed_per_iteration	logical	FALSE	TRUE, FALSE	-
skip_drop	numeric	0		[0, 1]
strict_shape	logical	FALSE	TRUE, FALSE	-
subsample	numeric	1		[0, 1]
top_k	integer	0		[0, ∞)
training	logical	FALSE	TRUE, FALSE	-
tree_method	character	auto	auto, exact, approx, hist, gpu_hist	-
tweedie_variance_power	numeric	1.5		[1, 2]
updater	untyped	-		-
verbose	integer	1		[0, 2]
watchlist	untyped	NULL		-
xgb_model	untyped	NULL		-

Early Stopping and Validation

In order to monitor the validation performance during the training, you can set the `$validate` field of the Learner. For information on how to configure the validation set, see the *Validation* section of `mlr3::Learner`. This validation data can also be used for early stopping, which can be enabled by setting the `early_stopping_rounds` parameter. The final (or in the case of early stopping best) validation scores can be accessed via `$internal_valid_scores`, and the optimal rounds via `$internal_tuned_values`. The internal validation measure can be set via the `eval_metric` parameter that can be a `mlr3::Measure`, a function, or a character string for the internal xgboost measures. Using an `mlr3::Measure` is slower than the internal xgboost measures, but allows to use the same measure for tuning and validation.

Initial parameter values

- nrounds:
 - Actual default: no default.
 - Adjusted default: 1000.
 - Reason for change: Without a default construction of the learner would error. The lightgbm learner has a default of 1000, so we use the same here.
- 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

`mlr3::Learner` -> `mlr3::LearnerRegr` -> `LearnerRegrXgboost`

Active bindings

`internal_valid_scores` (named `list()` or `NULL`) The validation scores extracted from `model$evaluation_log`. If early stopping is activated, this contains the validation scores of the model for the optimal nrounds, otherwise the nrounds for the final model.

`internal_tuned_values` (named `list()` or `NULL`) If early stopping is activated, this returns a list with nrounds, which is extracted from `$best_iteration` of the model and otherwise `NULL`.

`validate` (`numeric(1)` or `character(1)` or `NULL`) How to construct the internal validation data. This parameter can be either `NULL`, a ratio, "test", or "predefined". Returns the `$best_iteration` when early stopping is activated.

Methods**Public methods:**

- `LearnerRegrXgboost$new()`
- `LearnerRegrXgboost$importance()`
- `LearnerRegrXgboost$clone()`

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

Usage:

`LearnerRegrXgboost$new()`

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

Usage:

`LearnerRegrXgboost$importance()`

Returns: Named numeric().

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

Usage:

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

Arguments:

deep Whether to make a deep clone.

Note

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

References

Chen, Tianqi, Guestrin, Carlos (2016). “Xgboost: A scalable tree boosting system.” In *Proceedings of the 22nd ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, 785–794. ACM. doi:10.1145/2939672.2939785.

See Also

- Chapter in the **mlr3book**: https://mlr3book.mlr-org.com/chapters/chapter2/data_and_basic_modeling.html#sec-learners
- Package **mlr3extralearners** for more learners.
- **Dictionary of Learners**: `mlr3::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.

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.ranger`, `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`

Examples

```
## 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()
}

## End(Not run)

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

# use 30 percent for validation
# Set early stopping parameter
learner = lrn("regr.xgboost",
  nrounds = 100,
  early_stopping_rounds = 10,
  validate = 0.3
)

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

# Inspect optimal nrounds and validation performance
learner$internal_tuned_values
learner$internal_valid_scores

## End(Not run)
```

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