

Package ‘mlr3filters’

January 6, 2023

Title Filter Based Feature Selection for 'mlr3'

Version 0.7.0

Description Extends 'mlr3' with filter methods for feature selection. Besides standalone filter methods built-in methods of any machine-learning algorithm are supported. Partial scoring of multivariate filter methods is supported.

License LGPL-3

URL <https://mlr3filters.mlr-org.com>,
<https://github.com/mlr-org/mlr3filters>

BugReports <https://github.com/mlr-org/mlr3filters/issues>

Depends R (>= 3.1.0)

Imports backports, checkmate, data.table, mlr3 (>= 0.12.0), mlr3misc, paradox, R6

Suggests care, caret, carSurv, FSelectorRcpp, knitr, lgr, mlr3learners, mlr3measures, mlr3pipelines, praznik, rpart, testthat (>= 3.0.0), withr

Config/testthat/edition 3

Encoding UTF-8

NeedsCompilation no

RoxygenNote 7.2.3

Collate 'Filter.R' 'mlr_filters.R' 'FilterAUC.R' 'FilterAnova.R' 'FilterCMIM.R' 'FilterCarScore.R' 'FilterCarSurvScore.R' 'FilterCorrelation.R' 'FilterDISR.R' 'FilterFindCorrelation.R' 'FilterImportance.R' 'FilterInformationGain.R' 'FilterJMI.R' 'FilterJMIM.R' 'FilterKruskalTest.R' 'FilterMIM.R' 'FilterMRMR.R' 'FilterNJMIM.R' 'FilterPerformance.R' 'FilterPermutation.R' 'FilterRelief.R' 'FilterSelectedFeatures.R' 'FilterVariance.R' 'bibentries.R' 'ft.R' 'helper.R' 'reexports.R' 'zzz.R'

Author Patrick Schratz [aut] (<<https://orcid.org/0000-0003-0748-6624>>),
 Michel Lang [cre, aut] (<<https://orcid.org/0000-0001-9754-0393>>),
 Bernd Bischl [aut] (<<https://orcid.org/0000-0001-6002-6980>>),
 Martin Binder [aut]

Maintainer Michel Lang <michellang@gmail.com>

Repository CRAN

Date/Publication 2023-01-06 18:50:43 UTC

R topics documented:

mlr3filters-package	2
Filter	3
flt	6
mlr_filters	7
mlr_filters_anova	8
mlr_filters_auc	9
mlr_filters_carscore	10
mlr_filters_carsurvscore	12
mlr_filters_cmim	13
mlr_filters_correlation	14
mlr_filters_disr	16
mlr_filters_find_correlation	17
mlr_filters_importance	19
mlr_filters_information_gain	21
mlr_filters_jmi	22
mlr_filters_jmim	24
mlr_filters_kruskal_test	25
mlr_filters_mim	27
mlr_filters_mrmr	28
mlr_filters_njmim	30
mlr_filters_performance	32
mlr_filters_permutation	33
mlr_filters_relief	35
mlr_filters_selected_features	37
mlr_filters_variance	38
Index	41

mlr3filters-package *mlr3filters: Filter Based Feature Selection for 'mlr3'*

Description

Extends 'mlr3' with filter methods for feature selection. Besides standalone filter methods built-in methods of any machine-learning algorithm are supported. Partial scoring of multivariate filter methods is supported.

Author(s)

Maintainer: Michel Lang <michellang@gmail.com> ([ORCID](#))

Authors:

- Patrick Schratz <patrick.schratz@gmail.com> ([ORCID](#))
- Bernd Bischl <bernd_bischl@gmx.net> ([ORCID](#))
- Martin Binder <mlr.developer@mb706.com>

See Also

Useful links:

- <https://mlr3filters.mlr-org.com>
- <https://github.com/mlr-org/mlr3filters>
- Report bugs at <https://github.com/mlr-org/mlr3filters/issues>

Filter

Filter Base Class

Description

Base class for filters. Predefined filters are stored in the [dictionary mlr_filters](#). A Filter calculates a score for each feature of a task. Important features get a large value and unimportant features get a small value. Note that filter scores may also be negative.

Details

Some features support partial scoring of the feature set: If `nfeat` is not NULL, only the best `nfeat` features are guaranteed to get a score. Additional features may be ignored for computational reasons, and then get a score value of NA.

Public fields

`id` (character(1))

Identifier of the object. Used in tables, plot and text output.

`label` (character(1))

Label for this object. Can be used in tables, plot and text output instead of the ID.

`task_types` (character())

Set of supported task types, e.g. "classif" or "regr". Can be set to the scalar value NA to allow any task type.

For a complete list of possible task types (depending on the loaded packages), see [mlr_reflections\\$task_types\\$type](#)

`task_properties` (character())

[mlr3::Task](#) task properties.

`param_set` ([paradox::ParamSet](#))

Set of hyperparameters.

`feature_types` (`character()`)
 Feature types of the filter.

`packages` (`character()`)
 Packages which this filter is relying on.

`man` (`character(1)`)
 String in the format `[pkg]::[topic]` pointing to a manual page for this object. Defaults to NA, but can be set by child classes.

`scores` Stores the calculated filter score values as named numeric vector. The vector is sorted in decreasing order with possible NA values last. The more important the feature, the higher the score. Tied values (this includes NA values) appear in a random, non-deterministic order.

Active bindings

`properties` (`character()`)
 Properties of the filter. Currently, only "missings" is supported. A filter has the property "missings", iff the filter can handle missing values in the features in a graceful way. Otherwise, an assertion is thrown if missing values are detected.

Methods

Public methods:

- `Filter$new()`
- `Filter$format()`
- `Filter$print()`
- `Filter$help()`
- `Filter$calculate()`
- `Filter$clone()`

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

Usage:

```
Filter$new(
  id,
  task_types,
  task_properties = character(),
  param_set = ps(),
  feature_types = character(),
  packages = character(),
  label = NA_character_,
  man = NA_character_
)
```

Arguments:

`id` (`character(1)`)
 Identifier for the filter.

`task_types` (`character()`)
 Types of the task the filter can operator on. E.g., "classif" or "regr". Can be set to scalar NA to allow any task type.

`task_properties` (`character()`)
 Required task properties, see [mlr3::Task](#). Must be a subset of `mlr_reflections$task_properties`.

`param_set` ([paradox::ParamSet](#))
 Set of hyperparameters.

`feature_types` (`character()`)
 Feature types the filter operates on. Must be a subset of `mlr_reflections$task_feature_types`.

`packages` (`character()`)
 Set of required packages. Note that these packages will be loaded via [requireNamespace\(\)](#), and are not attached.

`label` (`character(1)`)
 Label for the new instance.

`man` (`character(1)`)
 String in the format `[pkg]::[topic]` pointing to a manual page for this object. The referenced help package can be opened via method `$help()`.

Method `format()`: Format helper for Filter class

Usage:

`Filter$format(...)`

Arguments:

... (ignored).

Method `print()`: Printer for Filter class

Usage:

`Filter$print()`

Method `help()`: Opens the corresponding help page referenced by field `$man`.

Usage:

`Filter$help()`

Method `calculate()`: Calculates the filter score values for the provided [mlr3::Task](#) and stores them in field `scores`. `nfeat` determines the minimum number of features to score (see details), and defaults to the number of features in `task`. Loads required packages and then calls `private$.calculate()` of the respective subclass.

This private method is expected to return a numeric vector, uniquely named with (a subset of) feature names. The returned vector may have missing values. Features with missing values as well as features with no calculated score are automatically ranked last, in a random order. If the task has no rows, each feature gets the score NA.

Usage:

`Filter$calculate(task, nfeat = NULL)`

Arguments:

`task` ([mlr3::Task](#))

[mlr3::Task](#) to calculate the filter scores for.

`nfeat` ([integer\(\)](#))

The minimum number of features to calculate filter scores for.

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

Usage:

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

Arguments:

deep Whether to make a deep clone.

See Also

Other Filter: [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

 flt

Syntactic Sugar for Filter Construction

Description

These functions complements [mlr_filters](#) with a function in the spirit of [mlr3::mlr_sugar](#).

Usage

```
flt(.key, ...)
```

```
flts(.keys, ...)
```

Arguments

.key	(character(1)) Key passed to the respective dictionary to retrieve the object.
...	(named list()) Named arguments passed to the constructor, to be set as parameters in the paradox::ParamSet , or to be set as public field. See mlr3misc::dictionary_sugar_get() for more details.
.keys	(character()) Keys passed to the respective dictionary to retrieve multiple objects.

Value

[Filter](#).

Examples

```
flt("correlation", method = "kendall")
flts(c("mrmr", "jmim"))
```

mlr_filters	<i>Dictionary of Filters</i>
-------------	------------------------------

Description

A simple [Dictionary](#) storing objects of class [Filter](#). Each Filter has an associated help page, see `mlr_filters_[id]`.

This dictionary can get populated with additional filters by add-on packages.

For a more convenient way to retrieve and construct filters, see `flt()`.

Usage

```
mlr_filters
```

Format

[R6Class](#) object

Usage

See [Dictionary](#).

See Also

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#)

Examples

```
mlr_filters$keys()
as.data.table(mlr_filters)
mlr_filters$get("mim")
flt("anova")
```

mlr_filters_anova	<i>ANOVA F-Test Filter</i>
-------------------	----------------------------

Description

ANOVA F-Test filter calling `stats::aov()`. Note that this is equivalent to a *t*-test for binary classification.

The filter value is $-\log_{10}(p)$ where *p* is the *p*-value. This transformation is necessary to ensure numerical stability for very small *p*-values.

Super class

`mlr3filters::Filter` -> `FilterAnova`

Methods

Public methods:

- `FilterAnova$new()`
- `FilterAnova$clone()`

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

Usage:

```
FilterAnova$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- `PipeOpFilter` for filter-based feature selection.
- Dictionary of Filters: `mlr_filters`

Other Filter: `Filter`, `mlr_filters_auc`, `mlr_filters_carscore`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_correlation`, `mlr_filters_disr`, `mlr_filters_find_correlation`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_jmi`, `mlr_filters_kruskal_test`, `mlr_filters_mim`, `mlr_filters_mrmr`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```

task = mlr3::tsk("iris")
filter = flt("anova")
filter$calculate(task)
head(as.data.table(filter), 3)

# transform to p-value
10^(-filter$scores)

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("anova"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}

```

mlr_filters_auc

*AUC Filter***Description**

Area under the (ROC) Curve filter, analogously to `mlr3measures::auc()` from **mlr3measures**. Missing values of the features are removed before calculating the AUC. If the AUC is undefined for the input, it is set to 0.5 (random classifier). The absolute value of the difference between the AUC and 0.5 is used as final filter value.

Super class

`mlr3filters::Filter` -> FilterAUC

Methods**Public methods:**

- `FilterAUC$new()`
- `FilterAUC$clone()`

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

Usage:

```
FilterAUC$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
task = mlr3::tsk("sonar")
filter = flt("auc")
filter$calculate(task)
head(as.data.table(filter), 3)

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("auc"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_carscore *Correlation-Adjusted Marginal Correlation Score Filter*

Description

Calculates the Correlation-Adjusted (marginal) coRelation scores (short CAR scores) implemented in [care::carscore\(\)](#) in package [care](#). The CAR scores for a set of features are defined as the correlations between the target and the decorrelated features. The filter returns the absolute value of the calculated scores.

Argument `verbose` defaults to `FALSE`.

Super class

`mlr3filters::Filter` -> `FilterCarScore`

Methods**Public methods:**

- `FilterCarScore$new()`
- `FilterCarScore$clone()`

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

Usage:

```
FilterCarScore$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

See Also

- `PipeOpFilter` for filter-based feature selection.
- `Dictionary of Filters: mlr_filters`

Other Filter: `Filter`, `mlr_filters_anova`, `mlr_filters_auc`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_correlation`, `mlr_filters_disr`, `mlr_filters_find_correlation`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_jmi`, `mlr_filters_kruskal_test`, `mlr_filters_mim`, `mlr_filters_mrmr`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```
if (requireNamespace("care")) {
  task = mlr3::tsk("mtcars")
  filter = flt("carscore")
  filter$calculate(task)
  head(as.data.table(filter), 3)

  ## changing the filter settings
  filter = flt("carscore")
  filter$param_set$values = list("diagonal" = TRUE)
  filter$calculate(task)
  head(as.data.table(filter), 3)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "care", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("mtcars")
}
```

```
# Note: `filter.frac` is selected randomly and should be tuned.

graph = po("filter", filter = flt("carscore"), filter.frac = 0.5) %>>%
  po("learner", mlr3::lrn("regr.rpart"))

graph$train(task)
}
```

mlr_filters_carsurvscore

Correlation-Adjusted Survival Score Filter

Description

Calculates CARS scores for right-censored survival tasks. Calls the implementation in `carSurv::carSurvScore()` in package **carSurv**.

Super class

`mlr3filters::Filter` -> `FilterCarSurvScore`

Methods

Public methods:

- `FilterCarSurvScore$new()`
- `FilterCarSurvScore$clone()`

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

Usage:

```
FilterCarSurvScore$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Bommert A, Welchowski T, Schmid M, Rahnenführer J (2021). "Benchmark of filter methods for feature selection in high-dimensional gene expression survival data." *Briefings in Bioinformatics*, **23**(1). doi:0.1093/bib/bbab354.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

mlr_filters_cmim	<i>Minimal Conditional Mutual Information Maximization Filter</i>
------------------	---

Description

Minimal conditional mutual information maximization filter calling `praznik::CMIM()` from package **praznik**.

This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: 1, (k-1)/k, ..., 1/k where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to \emptyset for auto-detecting the number of available cores.

Super class

`mlr3filters::Filter` -> `FilterCMIM`

Methods**Public methods:**

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

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

Usage:

```
FilterCMIM$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("cmim")
  filter$calculate(task, nfeat = 2)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("cmim"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_correlation

Correlation Filter

Description

Simple correlation filter calling `stats::cor()`. The filter score is the absolute value of the correlation.

Super class

```
mlr3filters::Filter -> FilterCorrelation
```

Methods**Public methods:**

- `FilterCorrelation$new()`
- `FilterCorrelation$clone()`

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

Usage:

```
FilterCorrelation$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- `PipeOpFilter` for filter-based feature selection.
- Dictionary of Filters: `mlr_filters`

Other Filter: `Filter`, `mlr_filters_anova`, `mlr_filters_auc`, `mlr_filters_carscore`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_disr`, `mlr_filters_find_correlation`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_jmi`, `mlr_filters_kruskal_test`, `mlr_filters_mim`, `mlr_filters_mrmr`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```
## Pearson (default)
task = mlr3::tsk("mtcars")
filter = flt("correlation")
filter$calculate(task)
as.data.table(filter)

## Spearman
filter = FilterCorrelation$new()
filter$param_set$values = list("method" = "spearman")
```

```

filter$calculate(task)
as.data.table(filter)
if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("boston_housing")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("correlation"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("regr.rpart"))

  graph$train(task)
}

```

mlr_filters_disr

*Double Input Symmetrical Relevance Filter***Description**

Double input symmetrical relevance filter calling `praznik::DISR()` from package **praznik**.

This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: $1, (k-1)/k, \dots, 1/k$ where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to \emptyset for auto-detecting the number of available cores.

Super class

`mlr3filters::Filter` -> `FilterDISR`

Methods**Public methods:**

- `FilterDISR$new()`
- `FilterDISR$clone()`

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

Usage:

```
FilterDISR$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("disr")
  filter$calculate(task)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("disr"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_find_correlation

Correlation Filter

Description

Simple filter emulating `caret::findCorrelation(exact = FALSE)`.

This gives each feature a score between 0 and 1 that is *one minus* the cutoff value for which it is excluded when using `caret::findCorrelation()`. The negative is used because `caret::findCorrelation()` excludes everything *above* a cutoff, while filters exclude everything below a cutoff. Here the filter scores are shifted by +1 to get positive values for to align with the way other filters work.

Subsequently `caret::findCorrelation(cutoff = 0.9)` lists the same features that are excluded with `FilterFindCorrelation` at score 0.1 (= 1 - 0.9).

Super class

`mlr3filters::Filter` -> `FilterFindCorrelation`

Methods**Public methods:**

- `FilterFindCorrelation$new()`
- `FilterFindCorrelation$clone()`

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

Usage:

```
FilterFindCorrelation$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

See Also

- `PipeOpFilter` for filter-based feature selection.
- Dictionary of Filters: `mlr_filters`

Other Filter: `Filter`, `mlr_filters_anova`, `mlr_filters_auc`, `mlr_filters_carscore`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_correlation`, `mlr_filters_disr`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_jmi`, `mlr_filters_kruskal_test`, `mlr_filters_mim`, `mlr_filters_mrmr`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```
# Pearson (default)
task = mlr3::tsk("mtcars")
filter = flt("find_correlation")
filter$calculate(task)
as.data.table(filter)
```

```

## Spearman
filter = flt("find_correlation", method = "spearman")
filter$calculate(task)
as.data.table(filter)

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("find_correlation"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}

```

mlr_filters_importance

Filter for Embedded Feature Selection via Variable Importance

Description

Variable Importance filter using embedded feature selection of machine learning algorithms. Takes a [mlr3::Learner](#) which is capable of extracting the variable importance (property "importance"), fits the model and extracts the importance values to use as filter scores.

Super class

[mlr3filters::Filter](#) -> FilterImportance

Public fields

learner ([mlr3::Learner](#))
Learner to extract the importance values from.

Methods

Public methods:

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

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

Usage:

```
FilterImportance$new(learner = mlr3::lrn("classif.featureless"))
```

Arguments:

learner ([mlr3::Learner](#))
Learner to extract the importance values from.

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

Usage:

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

Arguments:

deep Whether to make a deep clone.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("rpart")) {
  task = mlr3::tsk("iris")
  learner = mlr3::lrn("classif.rpart")
  filter = flt("importance", learner = learner)
  filter$calculate(task)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "mlr3learners"), quietly = TRUE)) {
  library("mlr3learners")
  library("mlr3pipelines")
  task = mlr3::tsk("sonar")

  learner = mlr3::lrn("classif.rpart")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("importance", learner = learner), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.log_reg"))

  graph$train(task)
}
```

`mlr_filters_information_gain`*Information Gain Filter*

Description

Information gain filter calling `FSelectorRcpp::information_gain()` in package **FSelectorRcpp**. Set parameter "type" to "gainratio" to calculate the gain ratio, or set to "symuncert" to calculate the symmetrical uncertainty (see `FSelectorRcpp::information_gain()`). Default is "infogain".

Argument `equal` defaults to FALSE for classification tasks, and to TRUE for regression tasks.

Super class

`mlr3filters::Filter` -> `FilterInformationGain`

Methods

Public methods:

- `FilterInformationGain$new()`
- `FilterInformationGain$clone()`

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

Usage:

```
FilterInformationGain$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmm](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```

if (requireNamespace("FSelectorRcpp")) {
  ## InfoGain (default)
  task = mlr3::tsk("sonar")
  filter = flt("information_gain")
  filter$calculate(task)
  head(filter$scores, 3)
  as.data.table(filter)

  ## GainRatio

  filterGR = flt("information_gain")
  filterGR$param_set$values = list("type" = "gainratio")
  filterGR$calculate(task)
  head(as.data.table(filterGR), 3)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "FSelectorRcpp", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("information_gain"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}

```

mlr_filters_jmi

Joint Mutual Information Filter

Description

Joint mutual information filter calling `praznik::JMI()` in package **praznik**.

This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: 1, (k-1)/k, ..., 1/k where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to 0 for auto-detecting the number of available cores.

Super class

`mlr3filters::Filter` -> FilterJMI

Methods**Public methods:**

- `FilterJMI$new()`
- `FilterJMI$clone()`

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

Usage:

```
FilterJMI$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- `PipeOpFilter` for filter-based feature selection.
- Dictionary of Filters: `mlr_filters`

Other Filter: `Filter`, `mlr_filters_anova`, `mlr_filters_auc`, `mlr_filters_carscore`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_correlation`, `mlr_filters_disr`, `mlr_filters_find_correlation`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_kruskal_test`, `mlr_filters_mim`, `mlr_filters_mrmm`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```
if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("jmi")
  filter$calculate(task, nfeat = 2)
  as.data.table(filter)
}
```

```

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("jmi"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}

```

mlr_filters_jmim

Minimal Joint Mutual Information Maximization Filter

Description

Minimal joint mutual information maximization filter calling `praznik::JMIM()` in package **praznik**. This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: 1, (k-1)/k, ..., 1/k where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to 0 for auto-detecting the number of available cores.

Super class

```
mlr3filters::Filter -> FilterJMIM
```

Methods

Public methods:

- `FilterJMIM$new()`
- `FilterJMIM$clone()`

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

Usage:

```
FilterJMIM$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("jmim")
  filter$calculate(task, nfeat = 2)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("jmim"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_kruskal_test

Kruskal-Wallis Test Filter

Description

Kruskal-Wallis rank sum test filter calling `stats::kruskal.test()`.

The filter value is $-\log_{10}(p)$ where p is the p -value. This transformation is necessary to ensure numerical stability for very small p -values.

Super class

```
mlr3filters::Filter -> FilterKruskalTest
```

Methods**Public methods:**

- `FilterKruskalTest$new()`
- `FilterKruskalTest$clone()`

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

Usage:

```
FilterKruskalTest$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- `PipeOpFilter` for filter-based feature selection.
- Dictionary of Filters: `mlr_filters`

Other Filter: `Filter`, `mlr_filters_anova`, `mlr_filters_auc`, `mlr_filters_carscore`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_correlation`, `mlr_filters_disr`, `mlr_filters_find_correlation`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_jmi`, `mlr_filters_mim`, `mlr_filters_mrmr`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```
task = mlr3::tsk("iris")
filter = flt("kruskal_test")
filter$calculate(task)
as.data.table(filter)

# transform to p-value
10^(-filter$scores)

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
```

```

library("mlr3pipelines")
task = mlr3::tsk("spam")

# Note: `filter.frac` is selected randomly and should be tuned.

graph = po("filter", filter = flt("kruskal_test"), filter.frac = 0.5) %>%
  po("learner", mlr3::lrn("classif.rpart"))

graph$train(task)
}

```

mlr_filters_mim

Mutual Information Maximization Filter

Description

Conditional mutual information based feature selection filter calling `praznik::MIM()` in package **praznik**.

This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: $1, (k-1)/k, \dots, 1/k$ where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to \emptyset for auto-detecting the number of available cores.

Super class

```
mlr3filters::Filter -> FilterMIM
```

Methods

Public methods:

- `FilterMIM$new()`
- `FilterMIM$clone()`

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

Usage:

```
FilterMIM$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- Dictionary of Filters: [mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("mim")
  filter$calculate(task, nfeat = 2)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("mim"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_mrmr

Minimum Redundancy Maximal Relevancy Filter

Description

Minimum redundancy maximal relevancy filter calling `praznik::MRMR()` in package **praznik**.

This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: $1, (k-1)/k, \dots, 1/k$ where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to \emptyset for auto-detecting the number of available cores.

Super class

`mlr3filters::Filter` -> `FilterMRMR`

Methods

Public methods:

- `FilterMRMR$new()`
- `FilterMRMR$clone()`

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

Usage:

```
FilterMRMR$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- `PipeOpFilter` for filter-based feature selection.
- Dictionary of Filters: `mlr_filters`

Other Filter: `Filter`, `mlr_filters_anova`, `mlr_filters_auc`, `mlr_filters_carscore`, `mlr_filters_carsurvscore`, `mlr_filters_cmim`, `mlr_filters_correlation`, `mlr_filters_disr`, `mlr_filters_find_correlation`, `mlr_filters_importance`, `mlr_filters_information_gain`, `mlr_filters_jmim`, `mlr_filters_jmi`, `mlr_filters_kruskal_test`, `mlr_filters_mim`, `mlr_filters_njmim`, `mlr_filters_performance`, `mlr_filters_permutation`, `mlr_filters_relief`, `mlr_filters_selected_features`, `mlr_filters_variance`, `mlr_filters`

Examples

```

if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("mrmr")
  filter$calculate(task, nfeat = 2)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("mrmr"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}

```

mlr_filters_njmim

*Minimal Normalised Joint Mutual Information Maximization Filter***Description**

Minimal normalised joint mutual information maximization filter calling `praznik::NJMIM()` from package **praznik**.

This filter supports partial scoring (see [Filter](#)).

Details

As the scores calculated by the **praznik** package are not monotone due to the greedy forward fashion, the returned scores simply reflect the selection order: $1, (k-1)/k, \dots, 1/k$ where k is the number of selected features.

Threading is disabled by default (hyperparameter `threads` is set to 1). Set to a number ≥ 2 to enable threading, or to \emptyset for auto-detecting the number of available cores.

Super class

```
mlr3filters::Filter -> FilterNJMIM
```

Methods**Public methods:**

- `FilterNJMIM$new()`
- `FilterNJMIM$clone()`

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

Usage:

```
FilterNJMIM$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

Kursa MB (2021). “Praznik: High performance information-based feature selection.” *SoftwareX*, **16**, 100819. doi:10.1016/j.softx.2021.100819.

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("praznik")) {
  task = mlr3::tsk("iris")
  filter = flt("njmim")
  filter$calculate(task, nfeat = 2)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart", "praznik"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("njmim"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_performance

Predictive Performance Filter

Description

Filter which uses the predictive performance of a `mlr3::Learner` as filter score. Performs a `mlr3::resample()` for each feature separately. The filter score is the aggregated performance of the `mlr3::Measure`, or the negated aggregated performance if the measure has to be minimized.

Super class

`mlr3filters::Filter` -> FilterPerformance

Public fields

learner (`mlr3::Learner`)

resampling (`mlr3::Resampling`)

measure (`mlr3::Measure`)

Methods

Public methods:

- `FilterPerformance$new()`
- `FilterPerformance$clone()`

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

Usage:

```
FilterPerformance$new(
  learner = mlr3::lrn("classif.featureless"),
  resampling = mlr3::rsmp("holdout"),
  measure = NULL
)
```

Arguments:

learner (`mlr3::Learner`)

`mlr3::Learner` to use for model fitting.

resampling (`mlr3::Resampling`)

`mlr3::Resampling` to be used within resampling.

measure (`mlr3::Measure`)

`mlr3::Measure` to be used for evaluating the performance.

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

Usage:

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

Arguments:

deep Whether to make a deep clone.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("rpart")) {
  task = mlr3::tsk("iris")
  learner = mlr3::lrn("classif.rpart")
  filter = flt("performance", learner = learner)
  filter$calculate(task)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("iris")
  l = lrn("classif.rpart")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("performance", learner = l), filter.frac = 0.5) %>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

```
mlr_filters_permutation
```

Permutation Score Filter

Description

The permutation filter randomly permutes the values of a single feature in a [mlr3::Task](#) to break the association with the response. The permuted feature, together with the unmodified features, is used to perform a [mlr3::resample\(\)](#). The permutation filter score is the difference between the aggregated performance of the [mlr3::Measure](#) and the performance estimated on the unmodified [mlr3::Task](#).

Parameters

standardize logical(1)
Standardize feature importance by maximum score.

nmc integer(1)
Number of Monte-Carlo iterations to use in computing the feature importance.

Super class

`mlr3filters::Filter` -> FilterPermutation

Public fields

learner (`mlr3::Learner`)

resampling (`mlr3::Resampling`)

measure (`mlr3::Measure`)

Methods**Public methods:**

- `FilterPermutation$new()`
- `FilterPermutation$clone()`

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

Usage:

```
FilterPermutation$new(
  learner = mlr3::lrn("classif.featureless"),
  resampling = mlr3::rsmp("holdout"),
  measure = NULL
)
```

Arguments:

learner (`mlr3::Learner`)
`mlr3::Learner` to use for model fitting.

resampling (`mlr3::Resampling`)
`mlr3::Resampling` to be used within resampling.

measure (`mlr3::Measure`)
`mlr3::Measure` to be used for evaluating the performance.

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

Usage:

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

Arguments:

deep Whether to make a deep clone.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("rpart")) {
  learner = mlr3::lrn("classif.rpart")
  resampling = mlr3::rsmp("holdout")
  measure = mlr3::msr("classif.acc")
  filter = flt("permutation", learner = learner, measure = measure, resampling = resampling,
             nmc = 2)
  task = mlr3::tsk("iris")
  filter$calculate(task)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("iris")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("permutation", nmc = 2), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

mlr_filters_relief *RELIEF Filter*

Description

Information gain filter calling `FSelectorRcpp::relief()` in package **FSelectorRepp**.

Super class

`mlr3filters::Filter` -> `FilterRelief`

Methods

Public methods:

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

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

Usage:

```
FilterRelief$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_selected_features](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("FSelectorRcpp")) {
  ## Relief (default)
  task = mlr3::tsk("iris")
  filter = flt("relief")
  filter$calculate(task)
  head(filter$scores, 3)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "FSelectorRcpp", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("iris")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("relief"), filter.frac = 0.5) %>>%
    po("learner", mlr3::lrn("classif.rpart"))

  graph$train(task)
}
```

`mlr_filters_selected_features`*Filter for Embedded Feature Selection*

Description

Filter using embedded feature selection of machine learning algorithms. Takes a [mlr3::Learner](#) which is capable of extracting the selected features (property "selected_features"), fits the model and extracts the selected features.

Note that contrary to [mlr_filters_importance](#), there is no ordering in the selected features. Selected features get a score of 1, deselected features get a score of 0. The order of selected features is random and different from the order in the learner. In combination with [mlr3pipelines](#), only the filter criterion cutoff makes sense.

Super class

[mlr3filters::Filter](#) -> FilterSelectedFeatures

Public fields

learner ([mlr3::Learner](#))
Learner to extract the importance values from.

Methods

Public methods:

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

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

Usage:

```
FilterSelectedFeatures$new(learner = mlr3::lrn("classif.featureless"))
```

Arguments:

learner ([mlr3::Learner](#))
Learner to extract the selected features from.

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

Usage:

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

Arguments:

deep Whether to make a deep clone.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_variance](#), [mlr_filters](#)

Examples

```
if (requireNamespace("rpart")) {
  task = mlr3::tsk("iris")
  learner = mlr3::lrn("classif.rpart")
  filter = flt("selected_features", learner = learner)
  filter$calculate(task)
  as.data.table(filter)
}

if (mlr3misc::require_namespaces(c("mlr3pipelines", "mlr3learners", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  library("mlr3learners")
  task = mlr3::tsk("sonar")

  filter = flt("selected_features", learner = lrn("classif.rpart"))

  # Note: All filter scores are either 0 or 1, i.e. setting `filter.cutoff = 0.5` means that
  # we select all "selected features".

  graph = po("filter", filter = filter, filter.cutoff = 0.5) %>>%
    po("learner", mlr3::lrn("classif.log_reg"))

  graph$train(task)
}
```

mlr_filters_variance *Variance Filter*

Description

Variance filter calling `stats::var()`.
Argument `na.rm` defaults to `TRUE` here.

Super class

`mlr3filters::Filter` -> `FilterVariance`

Methods

Public methods:

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

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

Usage:

```
FilterVariance$new()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

References

For a benchmark of filter methods:

Bommert A, Sun X, Bischl B, Rahnenführer J, Lang M (2020). “Benchmark for filter methods for feature selection in high-dimensional classification data.” *Computational Statistics & Data Analysis*, **143**, 106839. doi:10.1016/j.csda.2019.106839.

See Also

- [PipeOpFilter](#) for filter-based feature selection.
- [Dictionary of Filters: mlr_filters](#)

Other Filter: [Filter](#), [mlr_filters_anova](#), [mlr_filters_auc](#), [mlr_filters_carscore](#), [mlr_filters_carsurvscore](#), [mlr_filters_cmim](#), [mlr_filters_correlation](#), [mlr_filters_disr](#), [mlr_filters_find_correlation](#), [mlr_filters_importance](#), [mlr_filters_information_gain](#), [mlr_filters_jmim](#), [mlr_filters_jmi](#), [mlr_filters_kruskal_test](#), [mlr_filters_mim](#), [mlr_filters_mrmr](#), [mlr_filters_njmim](#), [mlr_filters_performance](#), [mlr_filters_permutation](#), [mlr_filters_relief](#), [mlr_filters_selected_features](#), [mlr_filters](#)

Examples

```
task = mlr3::tsk("mtcars")
filter = flt("variance")
filter$calculate(task)
head(filter$scores, 3)
as.data.table(filter)

if (mlr3misc::require_namespaces(c("mlr3pipelines", "rpart"), quietly = TRUE)) {
  library("mlr3pipelines")
  task = mlr3::tsk("spam")

  # Note: `filter.frac` is selected randomly and should be tuned.

  graph = po("filter", filter = flt("variance"), filter.frac = 0.5) %>>%
```

```
po("learner", mlr3::lrn("classif.rpart"))
graph$train(task)
}
```


Index

- * **Dictionary**
 - mlr_filters, 7
- * **Filter**
 - Filter, 3
 - mlr_filters, 7
 - mlr_filters_anova, 8
 - mlr_filters_auc, 9
 - mlr_filters_carscore, 10
 - mlr_filters_carsurvscore, 12
 - mlr_filters_cmim, 13
 - mlr_filters_correlation, 14
 - mlr_filters_disr, 16
 - mlr_filters_find_correlation, 17
 - mlr_filters_importance, 19
 - mlr_filters_information_gain, 21
 - mlr_filters_jmi, 22
 - mlr_filters_jmim, 24
 - mlr_filters_kruskal_test, 25
 - mlr_filters_mim, 27
 - mlr_filters_mrmmr, 28
 - mlr_filters_njmim, 30
 - mlr_filters_performance, 32
 - mlr_filters_permutation, 33
 - mlr_filters_relief, 35
 - mlr_filters_selected_features, 37
 - mlr_filters_variance, 38
- * **datasets**
 - mlr_filters, 7
- care::carscore(), 10
- caret::findCorrelation(), 18
- carSurv::carSurvScore(), 12
- character(), 4
- Dictionary, 7, 8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- dictionary, 3, 6
- Filter, 3, 6–8, 10, 11, 13–18, 20–31, 33, 35, 36, 38, 39
- FilterAnova (mlr_filters_anova), 8
- FilterAUC (mlr_filters_auc), 9
- FilterCarScore (mlr_filters_carscore), 10
- FilterCarSurvScore (mlr_filters_carsurvscore), 12
- FilterCMIM (mlr_filters_cmim), 13
- FilterCorrelation (mlr_filters_correlation), 14
- FilterDISR (mlr_filters_disr), 16
- FilterFindCorrelation (mlr_filters_find_correlation), 17
- FilterImportance (mlr_filters_importance), 19
- FilterInformationGain (mlr_filters_information_gain), 21
- FilterJMI (mlr_filters_jmi), 22
- FilterJMIM (mlr_filters_jmim), 24
- FilterKruskalTest (mlr_filters_kruskal_test), 25
- FilterMIM (mlr_filters_mim), 27
- FilterMRMR (mlr_filters_mrmmr), 28
- FilterNJMIM (mlr_filters_njmim), 30
- FilterPerformance (mlr_filters_performance), 32
- FilterPermutation (mlr_filters_permutation), 33
- FilterRelief (mlr_filters_relief), 35
- Filters, 8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- FilterSelectedFeatures (mlr_filters_selected_features), 37
- FilterVariance (mlr_filters_variance), 38
- flt, 6
- flt(), 7

- flts (flt), 6
- FSelectorRcpp::information_gain(), 21
- FSelectorRcpp::relief(), 35
- integer(), 5
- mlr3::Learner, 19, 20, 32, 34, 37
- mlr3::Measure, 32–34
- mlr3::mlr_sugar, 6
- mlr3::resample(), 32, 33
- mlr3::Resampling, 32, 34
- mlr3::Task, 3, 5, 33
- mlr3filters (mlr3filters-package), 2
- mlr3filters-package, 2
- mlr3filters::Filter, 8, 9, 11–13, 15, 16, 18, 19, 21, 23, 24, 26, 27, 29, 30, 32, 34, 35, 37, 38
- mlr3measures::auc(), 9
- mlr3misc::dictionary_sugar_get(), 6
- mlr_filters, 3, 6, 7, 8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_anova, 6, 7, 8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_auc, 6–8, 9, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_carscore, 6–8, 10, 10, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_carsurvscore, 6–8, 10, 11, 12, 14, 15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_cmim, 6–8, 10, 11, 13, 13, 15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_correlation, 6–8, 10, 11, 13, 14, 14, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_disr, 6–8, 10, 11, 13–15, 16, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_find_correlation, 6–8, 10, 11, 13–15, 17, 17, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_importance, 6–8, 10, 11, 13–15, 17, 18, 19, 21, 23, 25, 26, 28, 29, 31, 33, 35–39
- mlr_filters_information_gain, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_jmi, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 22, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_jmim, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 24, 26, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_kruskal_test, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 25, 28, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_mim, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 27, 29, 31, 33, 35, 36, 38, 39
- mlr_filters_mrmr, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 28, 31, 33, 35, 36, 38, 39
- mlr_filters_njmim, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 30, 33, 35, 36, 38, 39
- mlr_filters_performance, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 32, 35, 36, 38, 39
- mlr_filters_permutation, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 33, 36, 38, 39
- mlr_filters_relief, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 35, 38, 39
- mlr_filters_selected_features, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 37, 39
- mlr_filters_variance, 6–8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 38
- mlr_reflections\$task_feature_types, 5
- mlr_reflections\$task_properties, 5
- mlr_reflections\$task_types\$type, 3
- paradox::ParamSet, 3, 5, 6
- PipeOpFilter, 8, 10, 11, 13–15, 17, 18, 20, 21, 23, 25, 26, 28, 29, 31, 33, 35, 36, 38, 39
- praznik::CMIM(), 13
- praznik::DISR(), 16
- praznik::JMI(), 22
- praznik::JMIM(), 24
- praznik::MIM(), 27

praznik::MRMR(), [28](#)
praznik::NJMIM(), [30](#)

R6Class, [7](#)
requireNamespace(), [5](#)

stats::aov(), [8](#)
stats::cor(), [14](#)
stats::kruskal.test(), [25](#)