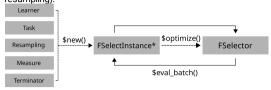
Feature Selection with mlr3fselect::CHEAT SHEET

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Class Overview

The package provides a set of R6 classes which allow to (a) define general feature selection instances; (b) run black-box optimzers; (c) combine learners with feature selection (for nested resampling).



[NB: In many table prints we suppres cols for readability.]

Terminators - When to stop

Construction: trm(.key, ...)

- evals (n_evals) After iterations.
- run_time (secs)
 After training time.
- clock_time (stop_time)
 At given timepoint.
- perf_reached (level)
 After performance was reached.
- stagnation (iters, threshold)
- stagnation (iters, threshold)
 After performance stagnated.
- stagnation_batch (n, threshold)
 After performance stagnated for batches.
- combo (list_of_terms, any=TRUE)
 Combine terminators with AND or OR.

as.data.table(mlr_terminators) # list all

Lists all available terminators.

FSelectInstance* - Search Scenario

Evaluator and container for resampled performances of feature subsets. The (internal) function eval_batch(xdt) calls benchmark() to evaluate a table of feature subsets. Stores archive of all evaluated feature subsets and the final result.

```
instance = FSelectInstanceSingleCrit$new(task,
    learner, resampling, measure, terminator)
```

store_benchmark_result = TRUE to store resampled
evals and store models = TRUE for fitted models.

Example instance = FSelectInstanceSingleCritSnew(task, learner, resampling, measure, terminator) fselector = fs("random_search", batch_size = 10) fselectorSoptimize(instance) instanceSresult # > Petal.Length Petal.Width Sepal.Length Sepal.Width classif.ce # > 1: FALSE TRUE TRUE 0.06

Use FSelectInstanceMultiCrit for multi-criteria feature selection.

FSelector - Search Strategy

Generates feature subsets and passes to instance for evaluation until termination. Creation: fs(.key, ...)

- random_search(batch_size) Random search.
- exhaustive_search (max_features)
 Exhaustive Search.
- sequential (strategy)
 Sequential Selection.
- rfe (feature_fraction, recursive)
 Recursive Feature Elimination.
- design_points (batch_size, design)
 User supplied feature subsets.

as.data.table(mlr_fselectors) # list all

Lists all available feature selection algorithms.

Logging and Parallelization

```
lgr::get_logger("bbotk`")$set_threshold("<level>")
```

Change log-level only for mlr3fselect.

future::plan(strategy)

Sets the parallelization backend. Speeds up feature selection by running iterations in parallel.

Executing the Feature Selection

Get evaluated feature subsets and performances; and result.

task\$select(instance\$result_feature_set)

Set optimized feature subset in Task.

instance = fselect(method = "random_search", task = tsk("iris"), learner = learner, resampling = rsmp ("holdout"), measure = msr("classif.ce"), term_evals = 28)

Use fselect()-shortcut.

AutoFSelector - Select before Train

Wraps learner and performs integrated feature selection.

```
afs = AutoFSelector$new(learner, resampling,
  measure, terminator, fselector)
```

Inherits from class Learner. Training starts feature selection on the training set. After completion the learner is trained with the "optimal" feature subset on the given task.

```
afs$train(task)
afs$predict(task, row_ids)
```

afs\$learner

Returns learner trained on full data set with optimized feature subset.

```
afsSfselect_result
# > Petal.Width Sepal.Length Sepal.Width classif.ce
# > 1: TRUE TRUE TRUE 0.02
```

Access feature selection result.

```
afs = auto_fselector(method = "random_search",
  learner, resampling, measure, term_evals = 20)
```

Use shortcut to create AutoFSelector.

Nested Resampling

Just resample AutoFSelector; now has inner and outer loop.

```
inner = rsmp("holdout")
afs = auto_fselector(method = "random_search", learner, inner, measure, term_evals =
20)
outer = rsmp("cv", folds = 2)
rr = resample(task, afs, outer, store_models = TRUE)

as.data.table(rr)
## > 1: <autoFselector(38) < ResamplingCV(19) > 1 < PredictionClassif(19) >
## > 2: <autoFselector(38) < ResamplingCV(19) > 2 < PredictionClassif(19) >
## > 2: <autoFselector(38) < ResamplingCV(19) > 2 < PredictionClassif(19) >
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```

```
extract_inner_fselect_results(rr)

# > iteration Petal.Width Sepal.Length Sepal.Width classif.ce

# > 1: 1 TRUE TRUE TRUE 0.04

# > 2: 2 TRUE TRUE FALSE 0.00
```

Check inner results for stable features.

```
rr$score()

# > learner iteration prediction classif.ce

# > 1: <a to fill > 1 < predictionClassif[19] > 0.02666667

# > 2: <a to fill <a href="#"><a to fill > 2 < predictionClassif[19] > 0.08000000</a>
```

Predictive performances estimated on the outer resampling.

```
extract_inner_fselect_archives(rr)

# > iteration Petal.Width Sepal.Length Sepal.Width classif.ce

# > 1: 1 FALSE TRUE FALSE 0.36

# > 21: 2 FALSE TRUE FALSE 0.44
```

All evaluated feature subsets.

```
rr$aggregate()
# > classif.ce
# > 0.05333333
```

Aggregates performances of outer resampling iterations.

```
rr = fselect_nested(method = "random_search", task,
  learner, inner, outer, measure, term_evals = 20)
```

Use shortcut to execute nested resampling.