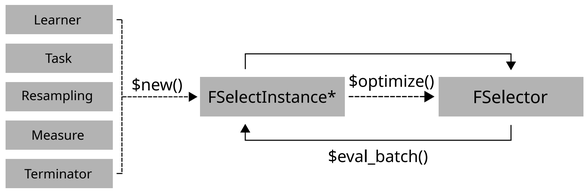
Feature Selection with mlr3fselect : : CHEAT SHEET

Class Overview

The package provides a set of R6 classes which allow to (a) define general feature selection instances and (b) run algorithms which optimize on these. (a) is called a FSelectInstanceSingleCrit or FSelectInstaneMultiCrit, which define a blackbox optimization function that maps feature subsets to resampled performance values for arbitrary performance measures.



Terminators - When to stop

Construction: `trm(.key, ...)`

- `evals` (`n_evals`)
  After a given amount of iterations.
- `clock_time` (`secs` , `stop_time`)
  After a given absolute time.
- `model_time` (`secs`)
  After a given training time.
- `perf_reached` (`level`)
  After a specific performance was reached.
- `stagnation` (`iters` , `threshold`)
  After the performance stagnated for given iterations.
- `stagnation_batch` (`n` , `threshold`)
  After the performance stagnated for given batches.

`as.data.table(mlr_terminators)`

Lists all available terminators.

FSelectInstance* - Search Scenario

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

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

Set `store_benchmark_result = TRUE` to store resamplings of evaluations and `store_models = TRUE` to store associated models.

Example

```
instance = FSelectInstanceSingleCrit$new(
  tsk("iris"), lrn("classif.rpart"), rsmp("cv"),
  msr("classif.ce"), trm("evals"))
fselector = fs("random_search")
fselector$optimize(instance)
```

Use `FSelectInstanceMultiCrit` for multi-criteria tuning.

FSelector - Search Strategy

Feature Selection strategy. Generates feature subsets and passes these to `FSelectInstance*` 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)`

Lists all available feature selection algorithms.

Executing the Feature Selection

`fselector$optimize(instance)`

Starts the feature selection. `FSelector` generates feature subsets and passes these to the `$eval_batch()` method of the `FSelectInstance*` until the budget of the `Terminator` is exhausted.

`instance$archive$data()`

Returns all evaluated feature subsets and their resampling results.

```
instance$archive$data()
##    Petal.Length Petal.Width Sepal.Length Sepal.Width classif.ce   uhash
## 1:         TRUE        TRUE         TRUE        TRUE       0.053 23b...
## 2:        FALSE        TRUE         TRUE        TRUE       0.042 45c...
```

`uhash` refers to `instance$archive$benchmark_result` .

`instance$result`

Returns data.table with optimal feature subset and estimated performance.

`task$select(instance$result_feature_set)`

Set optimized feature subset in `Task` .

AutoFSelector - Select before Train

Wraps learner and performs integrated feature selection.

```
at = 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.

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

Nested Resampling

Resampling the `AutoFSelector` results in nested resampling with an inner and outer loop.

Example

```
resampling_inner = rsmp("holdout")
evals20 = trm("evals", n_evals = 20)

at = AutoFSelector$new(learner, resampling_inner,
 measure, evals20, fselector)
at$store_fselect_instance = TRUE

resampling_outer = rsmp("cv", folds = 2)
rr = resample(task, at, resampling_outer,
 store_models = TRUE)

as.data.table(rr)
## ...          learner     resampling iteration              prediction
## ... <AutoFSelector> <ResamplingCV>         1     <PredictionClassif>
## ... <AutoFSelector> <ResamplingCV>         2     <PredictionClassif>
```

`rr$aggregate()`

Aggregates performances of outer folds.

`as.data.table(rr)$learner[[1]]$fselect_result`

Retrieves inner feature selection results.

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.