Package ‘mlr3viz’

August 7, 2020

Title Visualizations for 'mlr3'

Version 0.2.0

Description Provides visualizations for 'mlr3' objects such as tasks, predictions, resample results or benchmark results via the autoplot() generic of 'ggplot2'. The returned 'ggplot' objects are intended to provide sensible defaults, yet can easily be customized to create camera-ready figures. Visualizations include barplots, boxplots, histograms, ROC curves, and Precision-Recall curves.

License LGPL-3


BugReports https://github.com/mlr-org/mlr3viz/issues

Depends R (>= 3.1.0)

Imports checkmate, data.table, ggplot2 (>= 3.3.0), mlr3misc, utils

Suggests partykit, ggparty, GGally, lgr, mlr3 (>= 0.5.0), mlr3filters, mlr3proba (>= 0.2.0), precrec, rpart, survival, testthat

Encoding UTF-8

LazyData true

NeedsCompilation no

RoxygenNote 7.1.1

Author Michel Lang [cre, aut] (<https://orcid.org/0000-0001-9754-0393>), Patrick Schratz [aut] (<https://orcid.org/0000-0003-0748-6624>), Raphael Sonabend [aut] (<https://orcid.org/0000-0001-9225-4654>)

Maintainer Michel Lang <michellang@gmail.com>

Repository CRAN

Date/Publication 2020-08-07 09:40:02 UTC

R topics documented:

  mlr3viz-package .......................................................... 2
  as_precrec ................................................................. 3
mlr3viz-package

Description

Provides visualizations for `mlr3` objects such as tasks, predictions, resample results or benchmark results via the autoplot() generic of 'ggplot2'. The returned 'ggplot' objects are intended to provide sensible defaults, yet can easily be customized to create camera-ready figures. Visualizations include barplots, boxplots, histograms, ROC curves, and Precision-Recall curves.

Author(s)

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

Authors:

- Patrick Schratz <patrick.schratz@gmail.com> (ORCID)
- Raphael Sonabend <raphael.sonabend.15@ucl.ac.uk> (ORCID)

See Also

Useful links:

- https://mlr3viz.mlr-org.com
- https://github.com/mlr-org/mlr3viz
- Report bugs at https://github.com/mlr-org/mlr3viz/issues
as_precrec

Convert to 'precrec' Format

Description

Converts to a format which is understood by `precrec::evalmod()` of package `precrec`.

Usage

```r
as_precrec(object)
```

## S3 method for class `PredictionClassif`
```r
as_precrec(object)
```

## S3 method for class `ResampleResult`
```r
as_precrec(object)
```

## S3 method for class `BenchmarkResult`
```r
as_precrec(object)
```

Arguments

- `object` (any)
  
  Object to convert.

Value

Object as created by `precrec::mmdata()`.

autoplot.BenchmarkResult

Plot for BenchmarkResult

Description

Generates plots for `mlr3::BenchmarkResult`, depending on argument type:

- "boxplot" (default): Boxplots of performance measures, one box per `mlr3::Learner` and one facet per `mlr3::Task`.
- "roc": ROC curve (1 - specificity on x, sensitivity on y). The `mlr3::BenchmarkResult` may only have a single `mlr3::Task` and a single `mlr3::ResampleResult`. Note that you can subset any `mlr3::BenchmarkResult` with its `$filter()` method (see examples). Requires package `precrec`.
- "prc": Precision recall curve. See "roc".
autoplot.Filter

Usage

## S3 method for class 'BenchmarkResult'
autoplot(object, type = "boxplot", measure = NULL, ...) 

Arguments

object (mlr3::BenchmarkResult).
type (character(1)): Type of the plot. See description.
measure (mlr3::Measure).
... (any): Additional arguments, passed down to the respective geom.

Value

ggplot2::ggplot() object.

Examples

library(mlr3)
library(mlr3viz)

tasks = tsks(c("spam", "pima", "sonar"))
learner = lrns(c("classif.featureless", "classif.rpart"),
  predict_type = "prob")
resampling = rsmps("cv")
object = benchmark(benchmark_grid(tasks, learner, resampling))

head(fortify(object))
autoplot(object)
autoplot(object$clone()$filter(task_ids = "spam", type = "roc")
autoplot(object$clone()$filter(task_ids = "pima", type = "prc")

autoplot.Filter 
Plot for Filter Scores

Description

Generates plots for mlr3filters::Filter, depending on argument type:

- "barplot" (default): Bar plot of filter scores.

Usage

## S3 method for class 'Filter'
autoplot(object, type = "boxplot", n = Inf, ...)
Arguments

object (mlr3filters::Filter).
type (character(1)):
Type of the plot. See description.
n (integer(1))
Only include the first n features with highest importance. Defaults to all features.
...
(any): Additional argument, passed down to the respective geom.

Value

ggplot2::ggplot() object.

Examples

library(mlr3)
library(mlr3viz)
library(mlr3filters)

task = tsk("mtcars")
f = flt("correlation")
f$calculate(task)

head(fortify(f))
autoplot(f, n = 5)

---

autoplot.LearnerClassifRpart

Plot for LearnerClassifRpart

Description

Visualize trees for mlr3::mlr_learners_classif.rpart or mlr3::mlr_learners_regr.rpart using the package ggparty.

Contrary to ggparty, boxplots are shown in the terminal nodes for regression trees.

Note that learner-specific plots are experimental and subject to change.

Usage

## S3 method for class 'LearnerClassifRpart'
autoplot(object, ...)

## S3 method for class 'LearnerRegrRpart'
autoplot(object, ...)
autoplot.PredictionClassif

Arguments

object (mlr3::LearnerClassifRpart | mlr3::LearnerRegrRpart).

... (any): Additional arguments, passed down to ggparty::autoplot.party().

Value

ggplot2::ggplot() object.

Examples

library(mlr3)
library(mlr3viz)

task = tsk("spam")
learner = lrn("classif.rpart", keep_model = TRUE)
learner$train(task)
autoplot(learner)

autoplot.PredictionClassif

Plot for PredictionClassif

Description

Generates plots for mlr3::PredictionClassif, depending on argument type:

- "stacked" (default): Stacked barplot of true and estimated class labels.
- "roc": ROC curve (1 - specificity on x, sensitivity on y). Requires package precrec.
- "prc": Precision recall curve. Requires package precrec.

Usage

## S3 method for class 'PredictionClassif'
autoplot(object, type = "stacked", ...)

Arguments

object (mlr3::PredictionClassif).

type (character(1)):
Type of the plot. See description.

... (any): Additional arguments, passed down to the respective geom.

Value

ggplot2::ggplot() object.
Examples

```r
library(mlr3)
library(mlr3viz)

task = tsk("spam")
learner = lrn("classif.rpart", predict_type = "prob")
object = learner$train(task)$predict(task)

head(fortify(object))
autoplot(object)
autoplot(object, type = "roc")
autoplot(object, type = "prc")
```

Description

Generates plots for `mlr3::PredictionRegr`, depending on argument `type`:

- "xy" (default): Scatterplot of "true" response vs. "predicted" response. By default a linear model is fitted via `geom_smooth(method = "lm")` to visualize the trend between `x` and `y` (by default colored blue).
  - In addition `geom_abline()` with `slope = 1` is added to the plot.
  - Note that `geom_smooth()` and `geom_abline()` may overlap, depending on the given data.
- "histogram": Histogram of residuals: \( r = y - \hat{y} \).
- "residual": Plot of the residuals, with the response \( \hat{y} \) on the "x" and the residuals on the "y" axis.
  - By default a linear model is fitted via `geom_smooth(method = "lm")` to visualize the trend between `x` and `y` (by default colored blue).

Usage

```r
## S3 method for class 'PredictionRegr'
autoplot(object, type = "xy", ...)
```

Arguments

- `object`: (mlr3::PredictionRegr).
- `type`: (character(1)): Type of the plot. See description.
- `...`: (any): Additional arguments, passed down to the respective geom.

Value

`ggplot2::ggplot()` object.
Examples

```r
library(mlr3)
library(mlr3viz)

task = tsk("boston_housing")
learner = lrn("regr.rpart")
object = learner$train(task)$predict(task)

head(fortify(object))
autoplot(object)
autoplot(object, type = "histogram", binwidth = 1)
autoplot(object, type = "residual")
```

---

**autoplot.ResampleResult**

*Plot for ResampleResult*

Description

Generates plots for `mlr3::ResampleResult`, depending on argument `type`:

- "boxplot" (default): Boxplot of performance measures.
- "histogram": Histogram of performance measures.
- "roc": ROC curve (1 - specificity on x, sensitivity on y). The predictions of the individual `mlr3::Resamplings` are merged prior to calculating the ROC curve (micro averaged). Requires package `precrec`.
- "prc": Precision recall curve. See "roc".
- "prediction": Plots the learner prediction for a grid of points. Needs models to be stored. Set `store_models = TRUE` for `mlr3::resample`. For classification, we support tasks with exactly two features and learners with predict_type= set to "response" or "prob". For regression, we support tasks with one or two features. For tasks with one feature we can print confidence bounds if the predict type of the learner was set to "se". For tasks with two features the predict type will be ignored.

Usage

```r
## S3 method for class 'ResampleResult'
autoplot(object, type = "boxplot", measure = NULL, predict_sets = "test", ...) 
```

Arguments

- `object` *(mlr3::ResampleResult)*.
- `type` *(character(1))*: Type of the plot. See description.
- `measure` *(mlr3::Measure)*.
autoplot.TaskClassif

predict_sets (character())

Only for type set to "prediction". Which points should be shown in the plot?
Can be a subset of ("train", "test") or empty.

... (any): Additional arguments, passed down to the respective geom.

Value

ggplot2::ggplot() object.

Examples

library(mlr3)
library(mlr3viz)

task = tsk("sonar")
learner = lrn("classif.rpart", predict_type = "prob")
resampling = rsmp("cv")
object = resample(task, learner, resampling)

head(fortify(object))

# Default: boxplot
autoplot(object)

# Histogram
autoplot(object, type = "histogram", bins = 30)

# ROC curve, averaged over resampling folds:
autoplot(object, type = "roc")

# ROC curve of joint prediction object:
autoplot(object$prediction(), type = "roc")

# Precision Recall Curve
autoplot(object, type = "prc")

# Prediction Plot
task = tsk("iris")$select(c("Sepal.Length", "Sepal.Width"))
resampling = rsmp("cv", folds = 3)
object = resample(task, learner, resampling, store_models = TRUE)
autoplot(object, type = "prediction")

Description

Generates plots for mlr3::TaskClassif, depending on argument type:

- "target" (default): Bar plot of the target variable (default).
- "duo": Passes data and additional arguments down to `GGally::ggduo()`. `columnsX` is target, `columnsY` is features.
- "pairs": Passes data and additional arguments down to `GGally::ggpairs()`. Color is set to target column.

Usage

```r
## S3 method for class 'TaskClassif'
autoplot(object, type = "target", ...)
```

Arguments

- `object` (mlr3::TaskClassif):
- `type` (character(1)); Type of the plot. See description.
- `...` (any): Additional argument, possibly passed down to the underlying plot functions.

Value

`ggplot2::ggplot()` object.

Examples

```r
library(mlr3)
library(mlr3viz)

task = tsk("iris")
head(fortify(task))
autoplot(task)
autoplot(task$clone()$select(c("Sepal.Length", "Sepal.Width")),
  type = "pairs")
autoplot(task, type = "duo")
```

---

**autoplot.TaskDens**

Plot for Density Tasks

Description

Generates plots for `mlr3proba::TaskDens`.

Usage

```r
## S3 method for class 'TaskDens'
autoplot(object, type = "dens", ...)
```
Arguments

object (mlr3proba::TaskDens).

object (mlr3proba::TaskDens).

type (character(1)): Type of the plot. Available choices:

- "dens": histogram density estimator (default) with `ggplot2::geom_histogram()`.
- "freq": histogram frequency plot with `ggplot2::geom_histogram()`.
- "overlay": histogram with overlaid density plot with `ggplot2::geom_histogram()` and `ggplot2::geom_density()`.
- "freqpoly": frequency polygon plot with `ggplot2::geom_freqpoly`.

... (any): Additional arguments, possibly passed down to the underlying plot functions.

Value

`ggplot2::ggplot()` object.

Examples

```r
library(mlr3)
library(mlr3proba)
task = tsk("precip")

head(fortify(task))
autoplot(task, bins = 15)
autoplot(task, type = "freq", bins = 15)
autoplot(task, type = "overlay", bins = 15)
autoplot(task, type = "freqpoly", bins = 15)
```

Description

Generates plots for `mlr3::TaskRegr`, depending on argument type:

- "target": Box plot of target variable (default).
- "pairs": Passes data and additional arguments down to `GGally::ggpairs()`. Color is set to target column.

Usage

```r
## S3 method for class 'TaskRegr'
autoplot(object, type = "target", ...)
```
autplot.TaskSurv

Arguments

object        (mlr3proba::TaskSurv).

\texttt{type} (character(1)):
Type of the plot. Available choices:

\texttt{...} (any): Additional argument, passed down to $\text{formula}$ of \texttt{mlr3proba::TaskSurv}
or the underlying plot functions.

Value

\texttt{ggplot2::ggplot()} object.

Examples

\begin{verbatim}
library(mlr3)
library(mlr3viz)

    task = tsk("mtcars")
    task$select(c("am", "carb"))

    head(fortify(task))
    autoplot(task)
    autoplot(task, type = "pairs")
\end{verbatim}

autplot.TaskSurv \hspace{1cm} \textit{Plot for Survival Tasks}

Description

Generates plots for \texttt{mlr3proba::TaskSurv}, depending on argument \texttt{type}:

\begin{itemize}
\item "target": Calls \texttt{GGally::ggsurv()} on a \texttt{survival::survfit()} object.
\item "duo": Passes data and additional arguments down to \texttt{GGally::ggduo()}. columnsX is target, columnsY is features.
\item "pairs": Passes data and additional arguments down to \texttt{GGally::ggpairs()}. Color is set to target column.
\end{itemize}

Usage

\begin{verbatim}
## S3 method for class 'TaskSurv'
autplot(object, type = "target", ...)
\end{verbatim}

Arguments

object        (mlr3proba::TaskSurv).

\texttt{type} (character(1)):
Type of the plot. Available choices:

\texttt{...} (any): Additional argument, passed down to \$\text{formula}$ of \texttt{mlr3proba::TaskSurv}
or the underlying plot functions.
Value

`ggplot2::ggplot()` object.

Examples

```r
library(mlr3)
library(mlr3viz)
library(mlr3proba)

task = tsk("lung")

head(fortify(task))
autoplot(task)
autoplot(task, rhs = "sex")
autoplot(task, type = "duo")
```

Description

Generates a plot for the mlr3::Prediction of a single mlr3::Learner on a single mlr3::Task.

- For classification we support tasks with exactly two features and learners with predict_type set to "response" or "prob".
- For regression we support tasks with one or two features. For tasks with one feature we print confidence bounds if the predict type of the learner was set to "se". For tasks with two features the predict type will be ignored.

Note that this function is a wrapper around `autoplot.ResampleResult()` for a temporary mlr3::ResampleResult using mlr3::mlr_resamplings_holdout with ratio 1 (all observations in training set).

Usage

`plot_learner_prediction(learner, task, grid_points = 100L, expand_range = 0)`

Arguments

- **learner** (mlr3::Learner): 
- **task** (mlr3::Task): 
- **grid_points** (integer(1)): Resolution of the grid. For factors, ordered and logicals this value is ignored.
- **expand_range** (numeric(1)): Expand the prediction range for numerical features.
predict_grid

Value

`ggplot2::ggplot()` object.

Examples

```r
library(mlr3)
library(mlr3viz)

task = tsk("pima")$select(c("age", "glucose"))
learner = lrn("classif.rpart", predict_type = "prob")
p = plot_learner_prediction(learner, task)
print(p)
```

---

predict_grid  Generates a data.table of evenly distributed points.

Description

For each point we have the predicted class / regression value in column response. If the learner predicts probabilities, a column ".prob.response" is added that contains the probability of the predicted class.

Usage

```r
predict_grid(learners, task, grid_points, expand_range)
```

Arguments

- `learners`: list of trained learners, each learner belongs to one resampling iteration
- `task`: the task all learners are trained on
- `grid_points`: (int): see sequenize
- `expand_range`: see sequenize
Index

as_precrec, 3
autoplot.BenchmarkResult, 3
autoplot.Filter, 4
autoplot.LearnerClassifRpart, 5
autoplot.LearnerRegrRpart
   (autoplot.LearnerClassifRpart), 5
autoplot.PredictionClassif, 6
autoplot.PredictionRegr, 7
autoplot.ResampleResult, 8
autoplot.ResampleResult(), 13
autoplot.TaskClassif, 9
autoplot.TaskDens, 10
autoplot.TaskRegr, 11
autoplot.TaskSurv, 12
GGally::ggduo(), 10, 12
GGally::ggpairs(), 10–12
GGally::ggsurv(), 12
ggparty::autoplot.party(), 6
ggplot2::geom_density(), 11
ggplot2::geom_histogram(), 11
ggplot2::ggplot(), 4–7, 9–14
mlr3::BenchmarkResult, 3, 4
mlr3::Learner, 3, 13
mlr3::LearnerClassifRpart, 6
mlr3::LearnerRegrRpart, 6
mlr3::Measure, 4, 8
mlr3::mlr_learners_classif.rpart, 5
mlr3::mlr_learners_regr.rpart, 5
mlr3::mlr_resamplings_holdout, 13
mlr3::Prediction, 13
mlr3::PredictionClassif, 6
mlr3::PredictionRegr, 7
mlr3::ResampleResult, 3, 8, 13
mlr3::Resampling, 8
mlr3::Task, 3, 13
mlr3::TaskClassif, 9, 10
mlr3::TaskRegr, 11, 12
mlr3filters::Filter, 4, 5
mlr3proba::TaskDens, 10, 11
mlr3proba::TaskSurv, 12
mlr3viz (mlr3viz-package), 2
mlr3viz-package, 2
plot_learner_prediction, 13
precrec::evalmod(), 3
precrec::mmdata(), 3
predict_grid, 14
survival::survfit(), 12