

Package ‘mlr3viz’

November 2, 2020

Title Visualizations for 'mlr3'

Version 0.5.0

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.

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URL <https://mlr3viz.mlr-org.com>, <https://github.com/mlr-org/mlr3viz>

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

Depends R (>= 3.1.0)

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

Suggests cluster, distr6 (>= 1.4.4), factoextra, GGally, ggfortify (>= 0.4.11), ggparty, glmnet, lgr, mlr3 (>= 0.6.0), mlr3cluster, mlr3filters, mlr3learners, mlr3proba (>= 0.2.3), partykit, preprec, rpart, stats, survival, testthat

Encoding UTF-8

LazyData true

NeedsCompilation no

RoxygenNote 7.1.1

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Repository CRAN

Date/Publication 2020-11-02 11:10:02 UTC

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mlr3viz-package	<i>mlr3viz: Visualizations for 'mlr3'</i>
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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.

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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

```
as_precrec(object)

## S3 method for class 'PredictionClassif'
as_precrec(object)

## S3 method for class 'ResampleResult'
as_precrec(object)

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

Arguments

object (any)
Object to convert.

Value

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

References

Saito T, Rehmsmeier M (2017). "Precrec: fast and accurate precision-recall and ROC curve calculations in R." *Bioinformatics*, **33**(1), 145-147. doi: [10.1093/bioinformatics/btw570](https://doi.org/10.1093/bioinformatics/btw570).

 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::Resampling`. Note that you can subset any `mlr3::BenchmarkResult` with its `$filter()` method (see examples). Requires package **precrec**. Additional arguments will be passed down to the respective `autoplot()` function in package **precrec**. Arguments `calc_avg` and `cb_alpha` are passed to `precrec::evalmod()`.
- "prc": Precision recall curve. See "roc".

Usage

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

Arguments

object	(<code>mlr3::BenchmarkResult</code>).
type	(character(1)): Type of the plot. See description.
measure	(<code>mlr3::Measure</code>).
...	(any): Additional arguments, passed down to the respective geom or plotting function.

Value

`ggplot2::ggplot()` object.

References

Saito T, Rehmsmeier M (2017). "Precrec: fast and accurate precision-recall and ROC curve calculations in R." *Bioinformatics*, **33**(1), 145-147. doi: [10.1093/bioinformatics/btw570](https://doi.org/10.1093/bioinformatics/btw570).

Examples

```
library(mlr3)
library(mlr3viz)

tasks = tsks(c("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$clone(deep = TRUE)$filter(task_ids = "pima"), type = "roc")

```

 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.LearnerClassifCVGlmnet
```

```
Plot for LearnerClassifGlmnet / LearnerRegrGlmnet / LearnerClassifCVGlmnet / LearnerRegrCVGlmnet
```

Description

Visualizations for `mlr3learners::mlr_learners_classif.glmnet`, `mlr3learners::mlr_learners_regr.glmnet`, `mlr3learners::mlr_learners_classif.cv_glmnet` and `mlr3learners::mlr_learners_regr.cv_glmnet` using the package **ggfortify**.

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

Usage

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

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

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

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

Arguments

```
object      (mlr3learners::LearnerClassifGlmnet | mlr3learners::LearnerRegrGlmnet | mlr3learners::LearnerRegrCVGlmnet | mlr3learners::LearnerClassifCVGlmnet)
...         (any): Additional arguments, passed down to ggparty::autoplot.party().
```

Value

```
ggplot2::ggplot() object.
```

References

Tang Y, Horikoshi M, Li W (2016). “ggfortify: Unified Interface to Visualize Statistical Result of Popular R Packages.” *The R Journal*, **8**(2), 474–485. doi: [10.32614/RJ2016060](https://doi.org/10.32614/RJ2016060).

Examples

```
## Not run:
library(mlr3)
library(mlr3viz)
library(mlr3learners)
```

```
# classification
task = tsk("sonar")
learner = lrn("classif.glmnet")
learner$train(task)
autoplot(learner)

# regression
task = tsk("mtcars")
learner = lrn("regr.glmnet")
learner$train(task)
autoplot(learner)

## End(Not run)
```

autoplot.LearnerClassifRpart

Plot for LearnerClassifRpart / LearnerRegrRpart

Description

Visualize trees for `mlr3::mlr_learners_classif.rpart` and `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, ...)
```

Arguments

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

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

Value

`ggplot2::ggplot()` object.

Examples

```
library(mlr3)
library(mlr3viz)

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

# regression
task = tsk("mtcars")
learner = lrn("regr.rpart", keep_model = TRUE)
learner$train(task)
autoplot(learner)
```

```
autoplot.LearnerClustHierarchical
```

Plot for Hierarchical Clustering Learners

Description

Visualize dendrograms for hierarchical clusterers using the package **factoextra**.

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

Usage

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

Arguments

`object` ([mlr3cluster::LearnerClustAgnes](#) | [mlr3cluster::LearnerClustDiana](#)).

`...` (any): Additional arguments, passed down to function [factoextra::fviz_dend\(\)](#) in package **factoextra**.

Value

[ggplot2::ggplot\(\)](#) object.

Examples

```
library(mlr3)
library(mlr3cluster)
library(mlr3viz)

task = mlr_tasks$get("usarrests")
```



```

# agnes clustering
learner = mlr_learners$get("clust.agnes")
learner$train(task)
autoplot(learner)

# diana clustering
learner = mlr_learners$get("clust.diana")
learner$train(task)
autoplot(learner,
  k = learner$param_set$values$k, rect_fill = TRUE,
  rect = TRUE, rect_border = "red")

```

```
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 or plotting function.

Value

[ggplot2::ggplot\(\)](#) object.

References

Saito T, Rehmsmeier M (2017). "Precrec: fast and accurate precision-recall and ROC curve calculations in R." *Bioinformatics*, **33**(1), 145-147. doi: [10.1093/bioinformatics/btw570](https://doi.org/10.1093/bioinformatics/btw570).

Examples

```
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")
```

```
autoplot.PredictionClust
```

Plot for PredictionClust

Description

Generates plots for `mlr3cluster::PredictionClust`, depending on argument type:

- "scatter" (default): scatterplot with correlation values and colored cluster assignments.
- "sil": Silhouette plot with mean silhouette value as a reference line. Requires package **ggfortify**.
- "pca": Perform PCA on data and color code cluster assignments. Inspired by and uses `ggfortify::autoplot.kmeans`.

Usage

```
## S3 method for class 'PredictionClust'
autoplot(object, task, row_ids = NULL, type = "scatter", ...)
```

Arguments

object	(<code>mlr3cluster::PredictionClust</code>).
task	(<code>mlr3cluster::TaskClust</code>).
row_ids	row ids to subset task data to ensure that only the data used to make predictions are shown in plots.
type	(<code>character(1)</code>): Type of the plot. See description.
...	(any): Additional arguments, passed down to the respective geom.

Value

`ggplot2::ggplot()` object.

References

Tang Y, Horikoshi M, Li W (2016). “ggfortify: Unified Interface to Visualize Statistical Result of Popular R Packages.” *The R Journal*, **8**(2), 474–485. doi: [10.32614/RJ2016060](https://doi.org/10.32614/RJ2016060).

Examples

```
library(mlr3)
library(mlr3cluster)
library(mlr3viz)

task = tsk("usarrests")
learner = lrn("clust.kmeans", centers = 3)
object = learner$train(task)$predict(task)

head(fortify(object))
autoplot(object, task)
```

```
autoplot.PredictionRegr
```

Plot for PredictionRegr

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

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

Arguments

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

Value

`ggplot2::ggplot()` object.

Examples

```
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.PredictionSurv

Plot for PredictionSurv

Description

Generates plots for `mlr3proba::PredictionSurv`, depending on argument type:

- "calib" (default): Calibration plot comparing the average predicted survival distribution to a Kaplan-Meier prediction, this is *not* a comparison of a stratified crank or lp prediction. object must have `distr` prediction. `geom_line()` is used for comparison split between the prediction (Pred) and Kaplan-Meier estimate (KM). In addition labels are added for the x (T) and y (S(T)) axes.

Usage

```
## S3 method for class 'PredictionSurv'
autoplot(
  object,
  type = "calib",
  task = NULL,
  row_ids = NULL,
  times = NULL,
  ...
)
```

Arguments

object	(<code>mlr3proba::PredictionSurv</code>).
type	(<code>character(1)</code>): Type of the plot. See description.

task	(mlr3proba::TaskSurv) If type = "calib" then task is passed to \$predict in the Kaplan-Meier learner.
row_ids	(integer()) If type = "calib" then row_ids is passed to \$predict in the Kaplan-Meier learner.
times	(numeric()) If type = "calib" then times is the values on the x-axis to plot over, if NULL uses all times from task.
...	(any): Additional arguments, currently unused.

Examples

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

learn = lrn("surv.coxph")
task = tsk("rats")
p = learn$train(task, row_ids = 1:100)$predict(task, row_ids = 101:200)
autoplot(p, type = "calib", task = task)
```

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**. Additional arguments will be passed down to the respective [autoplot\(\)](#) function in package **precrec**. Arguments calc_avg and cb_alpha are passed to [precrec::evalmod\(\)](#).
- "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

```
## 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).
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 or plotting function.

Value

ggplot2::ggplot() object.

References

Saito T, Rehmsmeier M (2017). "Precrec: fast and accurate precision-recall and ROC curve calculations in R." *Bioinformatics*, **33**(1), 145-147. doi: [10.1093/bioinformatics/btw570](https://doi.org/10.1093/bioinformatics/btw570).

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")
```

autoplot.TaskClassif *Plot for Classification Tasks*

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

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

Arguments

object	(<code>mlr3::TaskClassif</code>).
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

```
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.TaskClust *Plot for Clustering Tasks*

Description

Generates plots for `mlr3cluster::TaskClust`, depending on argument type:

- "pairs": Passes data and additional arguments down to `GGally::ggpairs()` (default).

Usage

```
## S3 method for class 'TaskClust'
autoplot(object, type = "pairs", ...)
```

Arguments

object	(<code>mlr3cluster::TaskClust</code>).
type	(character(1)): Type of the plot. See description.
...	(any): Additional argument, passed down to the underlying geom or plot functions.

Value

`ggplot2::ggplot()` object.

Examples

```
library(mlr3)
library(mlr3cluster)
library(mlr3viz)

task = mlr_tasks$get("usarrests")

head(fortify(task))
autoplot(task)
```

autoplot.TaskDens *Plot for Density Tasks*

Description

Generates plots for `mlr3proba::TaskDens`.

Usage

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

Arguments

object	(mlr3proba::TaskDens).
type	(character(1)): Type of the plot. Available choices: <ul style="list-style-type: none"> • "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

```
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)
```

autoplot.TaskRegr *Plot for Regression Tasks*

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

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

Arguments

object (mlr3::TaskRegr).
 type (character(1)): Type of the plot. See description.
 ... (any): Additional argument, passed down to the underlying geom or plot functions.

Value

ggplot2::ggplot() object.

Examples

```
library(mlr3)
library(mlr3viz)

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

head(fortify(task))
autoplot(task)
autoplot(task, type = "pairs")
```

autoplot.TaskSurv *Plot for Survival Tasks*

Description

Generates plots for `mlr3proba::TaskSurv`, depending on argument type:

- "target": Calls `GGally::ggsurv()` on a `survival::survfit()` object.
- "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

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

Arguments

object (mlr3proba::TaskSurv).
 type (character(1)): Type of the plot. Available choices:
 ... (any): Additional argument, passed down to \$formula of `mlr3proba::TaskSurv` or the underlying plot functions.

Value

`ggplot2::ggplot()` object.

Examples

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

task = tsk("lung")

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

plot_learner_prediction

Plot for Learner Predictions

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

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

Value

`ggplot2::ggplot()` object.

Examples

```
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	<i>Generates a data.table of evenly distributed points.</i>
--------------	---

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

```
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

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