

Package ‘fmeffects’

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Title Model-Agnostic Interpretations with Forward Marginal Effects

Version 0.1.3

Description Create local, regional, and global explanations for any machine learning model with forward marginal effects. You provide a model and data, and 'fmeffects' computes feature effects. The package is based on the theory in: C. A. Scholbeck, G. Casalicchio, C. Molnar, B. Bischl, and C. Heumann (2022) <[doi:10.48550/arXiv.2201.08837](https://doi.org/10.48550/arXiv.2201.08837)>.

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'NonLinearityMeasure.R' 'Partitioning.R' 'PartitioningCtree.R'
'PartitioningPlot.R' 'PartitioningRpart.R' 'Predictor.R'
'PredictorCaret.R' 'PredictorLM.R' 'PredictorMLR3.R'
'PredictorParsnip.R' 'Pruner.R' 'S3.R' 'ame.R' 'bikes.R'
'misc.R' 'zzz.R'

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fmeffects-package	<i>fmeffects</i>
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Description

Computes forward marginal effects (FME) for arbitrary supervised machine learning models. You provide a model and data, and 'fmeffects' gives you feature effects.

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See Also

Useful links:

- <https://holgstr.github.io/fmeffects/>
- <https://github.com/holgstr/fmeffects>
- Report bugs at <https://github.com/holgstr/fmeffects/issues>

ame

Computes AMEs for every feature (or a subset of features) of a model.

Description

This is a wrapper function for `AverageMarginalEffects$new(...)$compute()`. It computes Average Marginal Effects (AME) based on Forward Marginal Effects (FME) for a model. The AME is a simple mean FME and computed w.r.t. a feature variable and a model.

Usage

```
ame(model, data, features = NULL, ep.method = "none")
```

Arguments

model	The (trained) model, with the ability to predict on new data. This must be a <code>train.formula</code> (tidymodels), <code>Learner</code> (mlr3), <code>train</code> (caret), <code>lm</code> or <code>glm</code> object.
data	The data used for computing AMEs, must be <code>data.frame</code> or <code>data.table</code> .
features	If not <code>NULL</code> , a named list of the names of the feature variables for which AMEs should be computed, together with the desired step sizes. For numeric features, the step size must be a single number. For categorical features, the step size must be a character vector of category names that is a subset of the levels of the factor variable.
ep.method	String specifying the method used for extrapolation detection. One of "none" or "envelope". Defaults to "none".

Value

An `AverageMarginalEffects` object, with a field `results` containing a list of summary statistics, including

- `Feature`: The name of the feature.
- `step.size`: The `step.size` w.r.t. the specified feature.
- `AME`: The Average Marginal Effect for a step of length `step.size` w.r.t. the specified feature.
- `SD`: The standard deviation of FMEs for the specified feature and `step.size`.
- `0.25`: The 0.25-quantile of FMEs for the specified feature and `step.size`.
- `0.75`: The 0.75-quantile of FMEs for the specified feature and `step.size`.
- `n`: The number of observations included for the computation of the AME. This can vary for the following reasons: For categorical features, FMEs are only computed for observations where the original category is not the `step.size` category. For numerical features, FMEs are only computed for observations that are not extrapolation points (if `ep.method` is set to "envelope").

References

Scholbeck, C.A., Casalicchio, G., Molnar, C. et al. Marginal effects for non-linear prediction functions. *Data Min Knowl Disc* (2024). <https://doi.org/10.1007/s10618-023-00993-x>

Examples

```
# Train a model:

library(mlr3verse)
library(ranger)
data(bikes, package = "fmeffects")
set.seed(123)
task = as_task_regr(x = bikes, id = "bikes", target = "count")
forest = lrn("regr.ranger")$train(task)

# Compute AMEs for all features:
## Not run:
overview = ame(model = forest, data = bikes)
summary(overview)

# Compute AMEs for a subset of features with non-default step.sizes:
overview = ame(model = forest,
               data = bikes,
               features = list(humidity = 0.1, weather = c("clear", "rain")))
summary(overview)

# Extract results:
overview$results

## End(Not run)
```

AverageMarginalEffects

R6 Class computing Average Marginal Effects (AME) based on Forward Marginal Effects (FME) for a model

Description

The AME is a simple mean FME and computed w.r.t. a feature variable and a model.

Public fields

predictor Predictor object

features vector of features for which AMEs should be computed

ep.method string specifying extrapolation detection method

results data.table with AMEs computed

computed logical specifying if compute() has been run

Methods

Public methods:

- [AverageMarginalEffects\\$new\(\)](#)
- [AverageMarginalEffects\\$compute\(\)](#)
- [AverageMarginalEffects\\$clone\(\)](#)

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

Usage:

```
AverageMarginalEffects$new(model, data, features = NULL, ep.method = "none")
```

Arguments:

`model` The (trained) model, with the ability to predict on new data. This must be a `train.formula` (tidymodels), `Learner` (mlr3), `train` (caret), `lm` or `glm` object.

`data` The data used for computing AMEs, must be `data.frame` or `data.table`.

`features` If not `NULL`, a named list of the names of the feature variables for which AMEs should be computed, together with the desired step sizes. For numeric features, the step size must be a single number. For categorical features, the step size must be a character vector of category names that is a subset of the levels of the factor variable.

`ep.method` String specifying the method used for extrapolation detection. One of "none" or "envelope". Defaults to "none".

Returns: A new AME object.

Examples:

```

# Train a model:

library(mlr3verse)
library(ranger)
set.seed(123)
data(bikes, package = "fmeffects")
task = as_task_regr(x = bikes, id = "bikes", target = "count")
forest = lrn("regr.ranger")$train(task)

# Compute AMEs for all features:
\dontrun{
overview = AverageMarginalEffects$new(
  model = forest,
  data = bikes)$compute()
summary(overview)

# Compute AMEs for a subset of features with non-default step.sizes:
overview = AverageMarginalEffects$new(model = forest,
                                     data = bikes,
                                     features = list(humidity = 0.1,
                                                    weather = c("clear", "rain")))$compute()

summary(overview)
}

```

Method `compute()`: Computes results, i.e., AMEs including the SD of FMEs, for an AME object.

Usage:

```
AverageMarginalEffects$compute()
```

Returns: An AME object with results.

Examples:

```

# Compute results:
\dontrun{
overview$compute()
}

```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

Examples

```

## -----
## Method `AverageMarginalEffects$new`
## -----

# Train a model:

```

```

library(mlr3verse)
library(ranger)
set.seed(123)
data(bikes, package = "fmeffects")
task = as_task_regr(x = bikes, id = "bikes", target = "count")
forest = lrn("regr.ranger")$train(task)

# Compute AMEs for all features:
## Not run:
overview = AverageMarginalEffects$new(
  model = forest,
  data = bikes)$compute()
summary(overview)

# Compute AMEs for a subset of features with non-default step.sizes:
overview = AverageMarginalEffects$new(model = forest,
  data = bikes,
  features = list(humidity = 0.1,
    weather = c("clear", "rain")))$compute()

summary(overview)

## End(Not run)

## -----
## Method `AverageMarginalEffects$compute`
## -----

# Compute results:
## Not run:
overview$compute()

## End(Not run)

```

bikes

Regression data of the usage of rental bikes in Washington D.C., USA

Description

This data set contains information on daily bike sharing usage in Washington, D.C. for the years 2011-2012. The target variable is count, the total number of bikes lent out to users at a specific day.

Usage

```
data(bikes)
```

Format

An object of class `data.frame` with 731 rows and 10 columns.

Details

This data frame contains the following columns:

season Season of the year
 year Year; 0=2011, 1=2012
 holiday If a day is a public holiday (y/n)
 weekday Day of the week
 workingday If a day is a working day (y/n)
 weather Weather situation
 temp Temperature in degrees celsius
 humidity Humidity (relative)
 windspeed Windspeed in miles per hour
 count Total number of bikes lent out to users

Source

The original data can be found on the [UCI](#) database (ID = 275).

References

Fanaee-T, Hadi, and Gama, Joao, "Event labeling combining ensemble detectors and background knowledge", *Progress in Artificial Intelligence* (2013): pp. 1-15, Springer Berlin Heidelberg, doi:10.1007/s13748-013-0040-3.

came

Computes a partitioning for a ForwardMarginalEffect

Description

This is a wrapper function that creates the correct subclass of `Partitioning`. It computes feature subspaces for semi-global interpretations of FMEs via recursive partitioning (RP).

Usage

```
came(
  effects,
  number.partitions = NULL,
  max.sd = Inf,
  rp.method = "ctree",
  tree.control = NULL
)
```


Arguments

<code>effects</code>	A <code>ForwardMarginalEffect</code> object with FMEs computed.
<code>number.partitions</code>	The exact number of partitions required. Either <code>number.partitions</code> or <code>max.sd</code> can be specified.
<code>max.sd</code>	The maximum standard deviation required in each partition. Among multiple partitionings with this criterion identified, the one with lowest number of partitions is selected. Either <code>number.partitions</code> or <code>max.sd</code> can be specified.
<code>rp.method</code>	One of <code>"ctree"</code> or <code>"rpart"</code> . The RP algorithm used for growing the decision tree. Defaults to <code>"ctree"</code> .
<code>tree.control</code>	Control parameters for the RP algorithm. One of <code>"ctree.control(...)"</code> or <code>"rpart.control(...)"</code> .

Value

Partitioning Object with identified feature subspaces.

References

Scholbeck, C.A., Casalicchio, G., Molnar, C. et al. Marginal effects for non-linear prediction functions. *Data Min Knowl Disc* (2024). <https://doi.org/10.1007/s10618-023-00993-x>

Examples

```
# Train a model and compute FMEs:

library(mlr3verse)
library(ranger)
data(bikes, package = "fmeffects")
task = as_task_regr(x = bikes, id = "bikes", target = "count")
forest = lrn("regr.ranger")$train(task)
effects = fme(model = forest, data = bikes, features = list("temp" = 1), ep.method = "envelope")

# Find a partitioning with exactly 3 subspaces:
subspaces = came(effects, number.partitions = 3)

# Find a partitioning with a maximum standard deviation of 20, use `rpart`:
library(rpart)
subspaces = came(effects, max.sd = 200, rp.method = "rpart")

# Analyze results:
summary(subspaces)
plot(subspaces)

# Extract results:
subspaces$results
subspaces$tree
```

fme *Computes FMEs.*

Description

This is a wrapper function for `FME$new(...)$compute()`. It computes forward marginal effects (FMEs) for a specified change in feature values.

Usage

```
fme(
  model,
  data,
  features,
  ep.method = "none",
  compute.nlm = FALSE,
  nlm.intervals = 1
)
```

Arguments

model	The (trained) model, with the ability to predict on new data. This must be a <code>train.formula</code> (<code>tidymodels</code>), <code>Learner</code> (<code>mlr3</code>), <code>train</code> (<code>caret</code>), <code>lm</code> or <code>glm</code> object.
data	The data used for computing FMEs, must be <code>data.frame</code> or <code>data.table</code> .
features	A named list with the feature name(s) and step size(s). The list names should correspond to the names of the feature variables affected by the step. The list must exclusively contain either numeric or categorical features, but not a combination of both. Numeric features must have a number as step size, categorical features the name of the reference category.
ep.method	String specifying the method used for extrapolation detection. One of "none" or "envelope". Defaults to "none".
compute.nlm	Compute NLMs for FMEs for numerical steps. Defaults to FALSE.
nlm.intervals	Number of intervals for computing NLMs. Results in longer computing time but more accurate approximation of NLMs. Defaults to 1.

Details

If one or more numeric features are passed to the `features` argument, FMEs are computed as

$$FME_{x,h_S} = f(x + h_S, x_{-S}) - f(x)$$

where h_S is the step size vector and x_{-S} the other features. If one or more categorical features are passed to `features`,

$$FME_{x,c_J} = f(c_J, x_{-J}) - f(x)$$

where c_J is the set of selected reference categories in `features` and x_{-J} the other features.

Value

ForwardsMarginalEffect object with the following fields:

- `ame` average marginal effect (AME).
- `anlm` average non-linearity measure (NLM).
- `extrapolation.ids` observations that have been identified as extrapolation points and not included in the analysis.
- `data.step`, a `data.table` of the feature matrix after the step has been applied.
- `results`, a `data.table` of the individual FMEs (and NLMs, if applicable) for all observations that are not extrapolation points.

References

Scholbeck, C.A., Casalicchio, G., Molnar, C. et al. Marginal effects for non-linear prediction functions. *Data Min Knowl Disc* (2024). <https://doi.org/10.1007/s10618-023-00993-x>

Examples

```
# Train a model:

library(mlr3verse)
library(ranger)
data(bikes, package = "fmeffects")
forest = lrn("regr.ranger")$train(as_task_regr(x = bikes, target = "count"))

# Compute FMEs for a numerical feature:
effects = fme(model = forest, data = bikes, features = list("temp" = 1), ep.method = "envelope")

# Analyze results:
summary(effects)
plot(effects)

# Extract results:
effects$results

# Compute the AME for a categorical feature:
fme(model = forest, data = bikes, features = list("weather" = "rain"))$ame
```

ForwardMarginalEffect *R6 Class representing a forward marginal effect (FME)*

Description

The FME is a forward difference in prediction due to a specified change in feature values.

Public fields

feature vector of features
 predictor Predictor object
 step.size vector of step sizes for features specified by "feature"
 data.step the data.table with the data matrix after the step
 ep.method string specifying extrapolation detection method
 compute.nlm logical specifying if NLM should be computed
 nlm.intervals number of intervals for computing NLMs
 step.type "numerical" or "categorical"
 extrapolation.ids vector of observation ids classified as extrapolation points
 results data.table with FMEs and NLMs computed
 ame Average Marginal Effect (AME) of observations in results
 anlm Average Non-linearity Measure (ANLM) of observations in results
 computed logical specifying if compute() has been run

Methods**Public methods:**

- [ForwardMarginalEffect\\$new\(\)](#)
- [ForwardMarginalEffect\\$compute\(\)](#)
- [ForwardMarginalEffect\\$plot\(\)](#)
- [ForwardMarginalEffect\\$clone\(\)](#)

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

Usage:

```

ForwardMarginalEffect$new(
  predictor,
  features,
  ep.method = "none",
  compute.nlm = FALSE,
  nlm.intervals = 1
)

```

Arguments:

predictor Predictor object.
 features A named list with the feature name(s) and step size(s).
 ep.method String specifying extrapolation detection method.
 compute.nlm Compute NLM with FMEs? Defaults to FALSE.
 nlm.intervals How many intervals for NLM computation. Defaults to 1.

Returns: A new `ForwardMarginalEffect` object.

Examples:

```
# Train a model:

library(mlr3verse)
library(ranger)
data(bikes, package = "fmeffects")
forest = lrn("regr.ranger")$train(as_task_regr(x = bikes, target = "count"))

# Create an `ForwardMarginalEffect` object:
effects = ForwardMarginalEffect$new(makePredictor(forest, bikes),
  features = list("temp" = 1, "humidity" = 0.01),
  ep.method = "envelope")
```

Method `compute()`: Computes results, i.e., FME (and NLMs) for non-extrapolation points, for a `ForwardMarginalEffect` object.

Usage:

```
ForwardMarginalEffect$compute()
```

Returns: A `ForwardMarginalEffect` object with results.

Examples:

```
# Compute results:
effects$compute()
```

Method `plot()`: Plots results, i.e., FME (and NLMs) for non-extrapolation points, for an FME object.

Usage:

```
ForwardMarginalEffect$plot(with.nlm = FALSE, bins = 40, binwidth = NULL)
```

Arguments:

`with.nlm` Plots NLMs if computed, defaults to `FALSE`.

`bins` Numeric vector giving number of bins in both vertical and horizontal directions. Applies only to univariate or bivariate numeric effects. See [ggplot2::stat_summary_hex\(\)](#) for details.

`binwidth` Numeric vector giving bin width in both vertical and horizontal directions. Overrides `bins` if both set. Applies only to univariate or bivariate numeric effects. See [ggplot2::stat_summary_hex\(\)](#) for details.

Examples:

```
# Compute results:
effects$plot()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

Examples

```
## -----
## Method `ForwardMarginalEffect$new`
## -----

# Train a model:

library(mlr3verse)
library(ranger)
data(bikes, package = "fmeffects")
forest = lrn("regr.ranger")$train(as_task_regr(x = bikes, target = "count"))

# Create an `ForwardMarginalEffect` object:
effects = ForwardMarginalEffect$new(makePredictor(forest, bikes),
                                     features = list("temp" = 1, "humidity" = 0.01),
                                     ep.method = "envelope")

## -----
## Method `ForwardMarginalEffect$compute`
## -----

# Compute results:
effects$compute()

## -----
## Method `ForwardMarginalEffect$plot`
## -----

# Compute results:
effects$plot()
```

makePredictor

User-friendly function to create a [Predictor](#).

Description

A wrapper function that creates the correct subclass of Predictor by automatically from model. Can be passed to the constructor of FME.

Usage

```
makePredictor(model, data)
```

Arguments

model	the (trained) model, with the ability to predict on new data.
data	the data used for computing FMEs, must be data.frame or data.table.

Examples

```
# Train a model:

library(mlr3verse)
data(bikes, package = "fmeffects")
task = as_task_regr(x = bikes, id = "bikes", target = "count")
forest = lrn("regr.ranger")$train(task)

# Create the predictor:
predictor = makePredictor(forest, bikes)

# This instantiated an object of the correct subclass of `Predictor`:
class(predictor)
```

 Partitioning

R6 Class representing a partitioning

Description

This is the abstract superclass for partitioning objects like [PartitioningCtree](#) and [PartitioningRpart](#). A Partitioning contains information about feature subspaces with conditional average marginal effects (cAME) computed for ForwardMarginalEffect objects.

Public fields

object a ForwardMarginalEffect object with results computed
 method the method for finding feature subspaces
 value the value of method
 results descriptive statistics of the resulting feature subspaces
 tree the tree representing the partitioning, a party object
 tree.control control parameters for the RP algorithm
 computed logical specifying if compute() has been run

Methods**Public methods:**

- [Partitioning\\$new\(\)](#)
- [Partitioning\\$compute\(\)](#)
- [Partitioning\\$plot\(\)](#)
- [Partitioning\\$clone\(\)](#)

Method `new()`: Create a Partitioning object

Usage:

`Partitioning$new(...)`

Arguments:

... Partitioning cannot be initialized, only its subclasses

Method `compute()`: Computes the partitioning, i.e., feature subspaces with more homogeneous FMEs, for a `ForwardMarginalEffect` object.

Usage:

```
Partitioning$compute()
```

Returns: An `Partitioning` object with results.

Examples:

```
# Compute results for an arbitrary partitioning:
# subspaces$compute()
```

Method `plot()`: Plots results, i.e., a decision tree and summary statistics of the feature subspaces, for an `Partitioning` object after `$compute()` has been run.

Usage:

```
Partitioning$plot()
```

Examples:

```
# Plot an arbitrary partitioning:
# subspaces$plot()
```

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

Examples

```
## -----
## Method `Partitioning$compute`
## -----

# Compute results for an arbitrary partitioning:
# subspaces$compute()

## -----
## Method `Partitioning$plot`
## -----

# Plot an arbitrary partitioning:
# subspaces$plot()
```

PartitioningCtree	<i>PartitioningCtree</i>
-------------------	--------------------------

Description

This task specializes [Partitioning](#) for the ctree algorithm for recursive partitioning.

It is recommended to use [came\(\)](#) for construction of Partitioning objects.

Super class

[fmeffects::Partitioning](#) -> PartitioningCtree

Methods

Public methods:

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

Method [new\(\)](#): Create a new PartitioningCtree object.

Usage:

```
PartitioningCtree$new(object, method, value, tree.control = NULL)
```

Arguments:

`object` an FME object with results computed.

`method` the method for finding feature subspaces.

`value` the value of method.

`tree.control` control parameters for the RP algorithm.

Method [clone\(\)](#): The objects of this class are cloneable with this method.

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

PartitioningRpart *PartitioningRpart*

Description

This task specializes [Partitioning](#) for the `rpart` algorithm for recursive partitioning.

It is recommended to use `came()` for construction of `Partitioning` objects.

Super class

`fmeffects::Partitioning` -> `PartitioningRpart`

Methods

Public methods:

- `PartitioningRpart$new()`
- `PartitioningRpart$clone()`

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

Usage:

```
PartitioningRpart$new(object, method, value, tree.control = NULL)
```

Arguments:

`object` An FME object with results computed.

`method` The method for finding feature subspaces.

`value` The value of method.

`tree.control` Control parameters for the RP algorithm.

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

plot.ForwardMarginalEffect
Plots an ForwardMarginalEffect object.

Description

Plots an ForwardMarginalEffect object.

Usage

```
## S3 method for class 'ForwardMarginalEffect'  
plot(x, ...)
```

Arguments

x object of class ForwardMarginalEffect. See the method `$plot()` in [ForwardMarginalEffect\(\)](#) for details.

... additional arguments affecting the summary produced.

plot.Partitioning *Plots an FME Partitioning.*

Description

Plots an FME Partitioning.

Usage

```
## S3 method for class 'Partitioning'  
plot(x, ...)
```

Arguments

x object of class Partitioning.

... additional arguments affecting the summary produced.

Predictor

R6 Class representing a predictor

Description

This is the abstract superclass for predictor objects like [PredictorMLR3](#) and [PredictorCaret](#). A Predictor contains information about an ML model's prediction function and training data.

Public fields

`model` The (trained) model, with the ability to predict on new data.

`target` A character vector with the name of the target variable.

`X` A `data.table` with feature and target variables.

`feature.names` A character vector with the names of the features in `X`.

`feature.types` A character vector with the types (numerical or categorical) of the features in `X`.

Methods

Public methods:

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

Method `new()`: Create a Predictor object

Usage:

```
Predictor$new(...)
```

Arguments:

... Predictor cannot be initialized, only its subclasses

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

PredictorCaret	<i>PredictorCaret</i>
----------------	-----------------------

Description

This task specializes [Predictor](#) for caret regression models. The model is assumed to be a `c("train", "train.formula")`.

It is recommended to use [makePredictor\(\)](#) for construction of Predictor objects.

Super class

`fmeffects::Predictor` -> PredictorCaret

Methods

Public methods:

- [PredictorCaret\\$new\(\)](#)
- [PredictorCaret\\$predict\(\)](#)
- [PredictorCaret\\$clone\(\)](#)

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

Usage:

```
PredictorCaret$new(model, data)
```

Arguments:

`model` train, train.formula object.

`data` The data used for computing FMEs, must be data.frame or data.table.

Method `predict()`: Predicts on an observation "newdata".

Usage:

```
PredictorCaret$predict(newdata)
```

Arguments:

`newdata` The feature vector for which the target should be predicted.

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

PredictorLM

PredictorLM

Description

This task specializes [Predictor](#) for `lm` and `lm`-type models. The model is assumed to be a `lm`.

It is recommended to use [makePredictor\(\)](#) for construction of Predictor objects.

Super class

`fmeffects::Predictor` -> PredictorLM

Methods

Public methods:

- [PredictorLM\\$new\(\)](#)
- [PredictorLM\\$predict\(\)](#)
- [PredictorLM\\$clone\(\)](#)

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

Usage:

```
PredictorLM$new(model, data)
```

Arguments:

`model` `train`, `train.formula` object.

`data` The data used for computing FMEs, must be `data.frame` or `data.table`.

Method `predict()`: Predicts on an observation "newdata".

Usage:

```
PredictorLM$predict(newdata)
```

Arguments:

`newdata` The feature vector for which the target should be predicted.

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

PredictorMLR3

PredictorMLR3

Description

This task specializes [Predictor](#) for mlr3 models. The model is assumed to be a `LearnerRegr` or `LearnerClassif`.

It is recommended to use [makePredictor\(\)](#) for construction of Predictor objects.

Super class

`fmeffects::Predictor` -> PredictorMLR3

Methods

Public methods:

- [PredictorMLR3\\$new\(\)](#)
- [PredictorMLR3\\$predict\(\)](#)
- [PredictorMLR3\\$clone\(\)](#)

Method `new()`: Create a new PredictorMLR3 object.

Usage:

```
PredictorMLR3$new(model, data)
```

Arguments:

`model` `LearnerRegr` or `LearnerClassif` object.

`data` The data used for computing FMEs, must be `data.frame` or `data.table`.

Method `predict()`: Predicts on an observation "newdata".

Usage:

```
PredictorMLR3$predict(newdata)
```

Arguments:

`newdata` The feature vector for which the target should be predicted.

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

Usage:

```
PredictorMLR3$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

PredictorParsnip *PredictorParsnip*

Description

This task specializes [Predictor](#) for parsnip models. The model is assumed to be a `model_fit` object.

It is recommended to use [makePredictor\(\)](#) for construction of Predictor objects.

Super class

`fmeffects::Predictor` -> PredictorParsnip

Methods

Public methods:

- [PredictorParsnip\\$new\(\)](#)
- [PredictorParsnip\\$predict\(\)](#)
- [PredictorParsnip\\$clone\(\)](#)

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

Usage:

```
PredictorParsnip$new(model, data)
```

Arguments:

`model` `model_fit` object.

`data` The data used for computing FMEs, must be `data.frame` or `data.table`.

Method `predict()`: Predicts on an observation "newdata".

Usage:

```
PredictorParsnip$predict(newdata)
```

Arguments:

`newdata` The feature vector for which the target should be predicted.

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

Usage:

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

Arguments:

`deep` Whether to make a deep clone.

```
print.ForwardMarginalEffect
```

Prints an ForwardMarginalEffect object.

Description

Prints an ForwardMarginalEffect object.

Usage

```
## S3 method for class 'ForwardMarginalEffect'  
print(x, ...)
```

Arguments

x object of class ForwardMarginalEffect.
... additional arguments affecting the summary produced.

```
print.Partitioning      Prints an FME Partitioning.
```

Description

Prints an FME Partitioning.

Usage

```
## S3 method for class 'Partitioning'  
print(x, ...)
```

Arguments

x object of class Partitioning.
... additional arguments affecting the summary produced.

summary.AverageMarginalEffects

Prints summary of an AverageMarginalEffects object.

Description

Prints summary of an AverageMarginalEffects object.

Usage

```
## S3 method for class 'AverageMarginalEffects'  
summary(object, ...)
```

Arguments

object object of class AverageMarginalEffects.
... additional arguments affecting the summary produced.

summary.ForwardMarginalEffect

Prints summary of an ForwardMarginalEffect object.

Description

Prints summary of an ForwardMarginalEffect object.

Usage

```
## S3 method for class 'ForwardMarginalEffect'  
summary(object, ...)
```

Arguments

object object of class ForwardMarginalEffect.
... additional arguments affecting the summary produced.

summary.Partitioning *Prints summary of an FME Partitioning.*

Description

Prints summary of an FME Partitioning.

Usage

```
## S3 method for class 'Partitioning'  
summary(object, ...)
```

Arguments

object	object of class Partitioning.
...	additional arguments affecting the summary produced.

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