Package 'iBreakDown'

October 13, 2022

Title Model Agnostic Instance Level Variable Attributions

Version 2.0.1

Description Model agnostic tool for decomposition of predictions from black boxes.
Supports additive attributions and attributions with interactions.
The Break Down Table shows contributions of every variable to a final prediction.
The Break Down Plot presents variable contributions in a concise graphical way.
This package works for classification and regression models.
It is an extension of the 'breakDown' package (Staniak and Biecek 2018) <doi:10.32614/RJ-2018-072>,
with new and faster strategies for orderings.
It supports interactions in explanations and has interactive visuals (implemented with 'D3.js' library).
The methodology behind is described in the 'iBreakDown' article (Gosiewska and Biecek 2019) <arXiv:1903.11420>
This package is a part of the 'DrWhy.AI' universe (Biecek 2018) <arXiv:1806.08915>.

Depends R (>= 3.5)

License GPL-3

Encoding UTF-8

RoxygenNote 7.1.1

Imports ggplot2

Suggests DALEX, knitr, rmarkdown, randomForest, e1071, ranger, nnet, testthat, r2d3, jsonlite, covr

VignetteBuilder knitr

URL https://ModelOriented.github.io/iBreakDown/, https://github.com/ModelOriented/iBreakDown

BugReports https://github.com/ModelOriented/iBreakDown/issues

NeedsCompilation no

Author Przemyslaw Biecek [aut, cre] (<https://orcid.org/0000-0001-8423-1823>),
Alicja Gosiewska [aut] (<https://orcid.org/0000-0001-6563-5742>),
Hubert Baniecki [aut] (<https://orcid.org/0000-0001-6661-5364>),
Adam Izdebski [aut],
Dariusz Komosinski [ctb]

Maintainer Przemyslaw Biecek <przemyslaw.biecek@gmail.com>
Repository CRAN
Date/Publication 2021-05-07 13:50:03 UTC

R topics documented:

break_down 2
break_down_uncertainty 4
describe 7
local_attributions 9
local_interactions 11
plot.break_down 14
plot.break_down_uncertainty 17
plotD3 19
plotD3.shap 21
print.break_down 23
print.break_down_description 24
print.break_down_uncertainty 24

Index **26**

`break_down` *Model Agnostic Sequential Variable Attributions*

Description

This function finds Variable Attributions via Sequential Variable Conditioning. It calls either `local_attributions` for additive attributions or `local_interactions` for attributions with interactions.

Usage

```
break_down(x, ..., interactions = FALSE)

## S3 method for class 'explainer'
break_down(x, new_observation, ..., interactions = FALSE)

## Default S3 method:
break_down(
  x,
  data,
  predict_function = predict,
  new_observation,
  keep_distributions = FALSE,
  order = NULL,
  label = class(x)[1],
  ...,
  interactions = FALSE
)
```

Arguments

x	an explainer created with function explain or a model.
...	parameters passed to local_* functions.
interactions	shall interactions be included?
new_observation	a new observation with columns that correspond to variables used in the model.
data	validation dataset, will be extracted from x if it is an explainer.
predict_function	predict function, will be extracted from x if it's an explainer.
keep_distributions	if TRUE, then distribution of partial predictions is stored and can be plotted with the generic plot().
order	if not NULL, then it will be a fixed order of variables. It can be a numeric vector or vector with names of variables.
label	name of the model. By default it is extracted from the 'class' attribute of the model.

Value

an object of the break_down class.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

See Also

local_attributions, local_interactions

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                               data = titanic_imputed,
                               y = titanic_imputed$survived,
                               label = "glm")

bd_glm <- break_down(explain_titanic_glm, titanic_imputed[1, ])
bd_glm
plot(bd_glm, max_features = 3)

## Not run:
## Not run:
```

```
library("randomForest")
set.seed(1313)
# example with interaction
# classification for HR data
model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                        data = HR[1:1000,1:5])

bd_rf <- break_down(explainer_rf,
                            new_observation)
head(bd_rf)
plot(bd_rf)

## End(Not run)
```

`break_down_uncertainty` *Explanation Level Uncertainty of Sequential Variable Attribution*

Description

This function calculates the break down algorithm for `B` random orderings. Then it calculates the distribution of attributions for these different orderings. Note that the `shap()` function is just a simplified interface to the `break_down_uncertainty()` function with a default value set to `B=25`.

Usage

```
break_down_uncertainty(x, ..., keep_distributions = TRUE, B = 10)

## S3 method for class 'explainer'
break_down_uncertainty(
  x,
  new_observation,
  ...,
  keep_distributions = TRUE,
  B = 10
)

## Default S3 method:
break_down_uncertainty(
  x,
  data,
  predict_function = predict,
  new_observation,
  label = class(x)[1],
  ...,
```

```
  path = NULL,
  keep_distributions = TRUE,
  B = 10
)

shap(x, ..., B = 25)
```

Arguments

x	an explainer created with function explain or a model.
...	other parameters.
keep_distributions	if TRUE then we will keep distribution for predicted values. It's needed by the describe function.
B	number of random paths
new_observation	a new observation with columns that correspond to variables used in the model.
data	validation dataset, will be extracted from x if it is an explainer.
predict_function	predict function, will be extracted from x if it is an explainer.
label	name of the model. By default it's extracted from the 'class' attribute of the model.
path	if specified, then this path will be highlighed on the plot. Use average in order to show an average effect

Value

an object of the break_down_uncertainty class.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

See Also

break_down, local_attributions

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                               data = titanic_imputed,
                               y = titanic_imputed$survived,
```

```
                          label = "glm")

# there is no explanation level uncertanity linked with additive models
bd_glm <- break_down_uncertainty(explain_titanic_glm, titanic_imputed[1, ])
bd_glm
plot(bd_glm)

## Not run:
## Not run:
library("randomForest")
set.seed(1313)
model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                        data = HR[1:1000, 1:5])

bd_rf <- break_down_uncertainty(explainer_rf,
                           new_observation)
bd_rf
plot(bd_rf)

# example for regression - apartment prices
# here we do not have intreactions
model <- randomForest(m2.price ~ . , data = apartments)
explainer_rf <- explain(model,
                        data = apartments_test[1:1000, 2:6],
                        y = apartments_test$m2.price[1:1000])

bd_rf <- break_down_uncertainty(explainer_rf, apartments_test[1,])
bd_rf
plot(bd_rf)

bd_rf <- break_down_uncertainty(explainer_rf, apartments_test[1,], path = 1:5)
plot(bd_rf)

bd_rf <- break_down_uncertainty(explainer_rf,
                                    apartments_test[1,],
                                    path = c("floor", "no.rooms", "district",
                                        "construction.year", "surface"))
plot(bd_rf)

bd <- break_down(explainer_rf,
                   apartments_test[1,])
plot(bd)

s <- shap(explainer_rf,
                  apartments_test[1,])
plot(s)

## End(Not run)
```

describe *Generates Textual Explanations for Predictive Models*

Description

Generic function describe generates natural language explanations based on break_down and shap explanations, what enhances their interpretability.

Usage

```
describe(x, nonsignificance_treshold = 0.15, ...)

## S3 method for class 'break_down'
describe(
  x,
  nonsignificance_treshold = 0.15,
  ...,
  label = NULL,
  short_description = FALSE,
  display_values = FALSE,
  display_numbers = FALSE,
  display_distribution_details = FALSE,
  display_shap = FALSE
)

## S3 method for class 'break_down_uncertainty'
describe(
  x,
  nonsignificance_treshold = 0.15,
  ...,
  label = NULL,
  short_description = FALSE,
  display_values = FALSE,
  display_numbers = FALSE,
  display_distribution_details = FALSE,
  display_shap = FALSE
)
```

Arguments

x	an explanation created with break_down or shap
nonsignificance_treshold	a numeric specifying a threshold for variable importance
...	other arguments
label	a character string describing model's prediction

`short_description`
: a boolean, returns a short description

`display_values`
: a boolean, displays variables' values

`display_numbers`
: a boolean, displays a description containing numerical values

`display_distribution_details`
: a boolean, displays details about the distribution of model's predictions

`display_shap`
: a boolean, adds information about variables' average contribution. Use only with shap explanation.

Details

Function `describe` generates a textual explanations by extracting information from a `break_down` or `shap` explanation. It makes an argument justifying why the model's prediction is lower or higher, than it's average prediction. The description consists of an introduction, argumenation and summary making use from the claim, support, evidence argumentation structure, as recomended for the World Universities Debating style.

The function first selects one of four different scenarios, due to `nonsignificance_treshold`. The chosen scenario can be one of the following: 1. Model's prediction for the selected instance is significantly higher than the average prediction. 2. Model's prediction is significantly lower. 3. Model's prediction is close to it's average prediction, however there are significant variables counteracting with each other 4. Model's prediction is close to it's average prediction and all the variables are rather nonsignificant. Then an explanation due to the chosen scenario is generated.

Value

A character string of textual explanation

Examples

```
library("DALEX")
library("randomForest")
library("iBreakDown")

titanic <- na.omit(titanic)
model_titanic_rf <- randomForest(survived == "yes" ~ gender + age + class + embarked +
                                 fare + sibsp + parch,  data = titanic)

explain_titanic_rf <- explain(model_titanic_rf,
                              data = titanic[ ,-9],
                              y = titanic$survived == "yes",
                              label = "Random Forest v7")

bd_explanation <- break_down(explain_titanic_rf, titanic[1, ], keep_distributions = TRUE)
plot(bd_explanation)

description <- describe(bd_explanation,
                        label = "the passanger will survive with probability",
                        short_description = FALSE,
                        display_values =  TRUE,
```

```
                        display_numbers = TRUE,
                        display_distribution_details = FALSE)

description

library("DALEX")
library("iBreakDown")
titanic <- na.omit(titanic)
model_titanic_glm <- glm(titanic$survived == "yes" ~ age + gender + class + fare + sibsp,
                         data = titanic[ ,-9], family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                               data = titanic[,-9],
                               y = titanic$survived == "yes",
                               label = "glm")
passanger <- titanic[1, -9]
shap_glm <- shap(explain_titanic_glm, passanger)
plot(shap_glm)

describe(shap_glm,
         label = "the selected passanger survives with probability",
         display_shap = TRUE,
         display_numbers = TRUE)
```

`local_attributions` *Model Agnostic Sequential Variable attributions*

Description

This function finds Variable attributions via Sequential Variable Conditioning. The complexity of this function is O(2*p). This function works in a similar way to step-up and step-down greedy approximations in function `break_down`. The main difference is that in the first step the order of variables is determined. And in the second step the impact is calculated.

Usage

```
local_attributions(x, ...)

## S3 method for class 'explainer'
local_attributions(x, new_observation, keep_distributions = FALSE, ...)

## Default S3 method:
local_attributions(
  x,
  data,
  predict_function = predict,
  new_observation,
  label = class(x)[1],
  keep_distributions = FALSE,
```

```
  order = NULL,
  ...
)
```

Arguments

x	an explainer created with function explain or a model.
...	other parameters.
new_observation	a new observation with columns that correspond to variables used in the model.
keep_distributions	if TRUE, then distribution of partial predictions is stored and can be plotted with the generic plot().
data	validation dataset, will be extracted from x if it is an explainer.
predict_function	predict function, will be extracted from x if it is an explainer.
label	name of the model. By default it's extracted from the 'class' attribute of the model.
order	if not NULL, then it will be a fixed order of variables. It can be a numeric vector or vector with names of variables.

Value

an object of the break_down class.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

See Also

break_down, local_interactions

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                           data = titanic_imputed,
                           y = titanic_imputed$survived,
                           label = "glm")

bd_glm <- local_attributions(explain_titanic_glm, titanic_imputed[1, ])
bd_glm
plot(bd_glm, max_features = 3)
```

```
## Not run:
## Not run:
library("randomForest")
set.seed(1313)
# example with interaction
# classification for HR data
model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                        data = HR[1:1000,1:5])

bd_rf <- local_attributions(explainer_rf,
                            new_observation)
bd_rf
plot(bd_rf)
plot(bd_rf, baseline = 0)

# example for regression - apartment prices
# here we do not have interactions
model <- randomForest(m2.price ~ . , data = apartments)
explainer_rf <- explain(model,
                        data = apartments_test[1:1000,2:6],
                        y = apartments_test$m2.price[1:1000])

bd_rf <- local_attributions(explainer_rf,
                            apartments_test[1,])
bd_rf
plot(bd_rf, digits = 1)

bd_rf <- local_attributions(explainer_rf,
                            apartments_test[1,],
                            keep_distributions = TRUE)
plot(bd_rf, plot_distributions = TRUE)

## End(Not run)
```

`local_interactions` *Model Agnostic Sequential Variable Attributions with Interactions*

Description

This function implements decomposition of model predictions with identification of interactions. The complexity of this function is O(2*p) for additive models and O(2*p^2) for interactions. This function works in a similar way to step-up and step-down greedy approximations in function `break_down()`. The main difference is that in the first step the order of variables and interactions is determined. And in the second step the impact is calculated.

Usage

```
local_interactions(x, ...)

## S3 method for class 'explainer'
local_interactions(x, new_observation, keep_distributions = FALSE, ...)

## Default S3 method:
local_interactions(
  x,
  data,
  predict_function = predict,
  new_observation,
  label = class(x)[1],
  keep_distributions = FALSE,
  order = NULL,
  interaction_preference = 1,
  ...
)
```

Arguments

x	an explainer created with function explain or a model.
...	other parameters.
new_observation	a new observation with columns that correspond to variables used in the model.
keep_distributions	if TRUE, then the distribution of partial predictions is stored in addition to the average.
data	validation dataset, will be extracted from x if it's an explainer.
predict_function	predict function, will be extracted from x if it's an explainer.
label	character - the name of the model. By default it's extracted from the 'class' attribute of the model.
order	if not NULL, then it will be a fixed order of variables. It can be a numeric vector or vector with names of variables/interactions.
interaction_preference	an integer specifying which interactions will be present in an explanation. The larger the integer, the more frequently interactions will be presented.

Value

an object of the break_down class.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

See Also

break_down, local_attributions

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                            data = titanic_imputed,
                            y = titanic_imputed$survived,
                            label = "glm")

bd_glm <- local_interactions(explain_titanic_glm, titanic_imputed[1, ],
       interaction_preference = 500)
bd_glm
plot(bd_glm, max_features = 2)

## Not run:
library("randomForest")
# example with interaction
# classification for HR data
model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                 data = HR[1:1000,1:5])

bd_rf <- local_interactions(explainer_rf,
                 new_observation)

bd_rf
plot(bd_rf)

# example for regression - apartment prices
# here we do not have intreactions
model <- randomForest(m2.price ~ . , data = apartments)
explainer_rf <- explain(model,
         data = apartments_test[1:1000,2:6],
         y = apartments_test$m2.price[1:1000])

new_observation <- apartments_test[1,]

bd_rf <- local_interactions(explainer_rf,
                 new_observation,
                 keep_distributions = TRUE)

bd_rf
plot(bd_rf)
plot(bd_rf, plot_distributions = TRUE)
```

```
## End(Not run)
```

---

plot.break_down *Plot Generic for Break Down Objects*

Description

Displays a waterfall break down plot for objects of break_down class.

Usage

```
## S3 method for class 'break_down'
plot(
  x,
  ...,
  baseline = NA,
  max_features = 10,
  min_max = NA,
  vcolors = DALEX::colors_breakdown_drwhy(),
  digits = 3,
  rounding_function = round,
  add_contributions = TRUE,
  shift_contributions = 0.05,
  plot_distributions = FALSE,
  vnames = NULL,
  title = "Break Down profile",
  subtitle = "",
  max_vars = NULL
)
```

Arguments

x	an explanation created with break_down
...	other parameters.
baseline	if numeric then veritical line starts in baseline.
max_features	maximal number of features to be included in the plot. default value is 10.
min_max	a range of OX axis. By default NA, therefore it will be extracted from the contributions of x. But it can be set to some constants, useful if these plots are to be used for comparisons.
vcolors	If NA (default), DrWhy colors are used.
digits	number of decimal places (round) or significant digits (signif) to be used. See the rounding_function argument.

rounding_function
: a function to be used for rounding numbers. This should be signif which keeps a specified number of significant digits or round (which is default) to have the same precision for all components.

add_contributions
: if TRUE, variable contributions will be added to the plot

shift_contributions
: number describing how much labels should be shifted to the right, as a fraction of range. By default equal to 0.05.

plot_distributions
: if TRUE then distributions of conditional propotions will be plotted. This requires keep_distributions=TRUE in the break_down, local_attributions, or local_interactions.

vnames
: a character vector, if specified then will be used as labels on OY axis. By default NULL

title
: a character. Plot title. By default "Break Down profile".

subtitle
: a character. Plot subtitle. By default "".

max_vars
: alias for the max_features parameter.

Value

a ggplot2 object.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                               data = titanic_imputed,
                               y = titanic_imputed$survived,
                               label = "glm")

bd_glm <- break_down(explain_titanic_glm, titanic_imputed[1, ])
bd_glm
plot(bd_glm, max_features = 3)
plot(bd_glm, max_features = 3,
    vnames = c("average","+ male","+ young","+ cheap ticket", "+ other factors", "final"))

## Not run:
## Not run:
library("randomForest")
```

```
set.seed(1313)
# example with interaction
# classification for HR data
model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                        data = HR[1:1000,1:5])

bd_rf <- local_attributions(explainer_rf,
                            new_observation)
bd_rf
plot(bd_rf)
plot(bd_rf, baseline = 0)
plot(bd_rf, min_max = c(0,1))

bd_rf <- local_attributions(explainer_rf,
                            new_observation,
                            keep_distributions = TRUE)
bd_rf
plot(bd_rf, plot_distributions = TRUE)

bd_rf <- local_interactions(explainer_rf,
                 new_observation,
                 keep_distributions = TRUE)

bd_rf
plot(bd_rf)
plot(bd_rf, plot_distributions = TRUE)

# example for regression - apartment prices
# here we do not have intreactions
model <- randomForest(m2.price ~ . , data = apartments)
explainer_rf <- explain(model,
                        data = apartments_test[1:1000,2:6],
                        y = apartments_test$m2.price[1:1000])

bd_rf <- local_attributions(explainer_rf,
                            apartments_test[1,])
bd_rf
plot(bd_rf, digits = 1)
plot(bd_rf, digits = 1, baseline = 0)

bd_rf <- local_attributions(explainer_rf,
                            apartments_test[1,],
                            keep_distributions = TRUE)
plot(bd_rf, plot_distributions = TRUE)

bd_rf <- local_interactions(explainer_rf,
                 new_observation = apartments_test[1,],
                 keep_distributions = TRUE)

bd_rf
```

```
plot(bd_rf)
plot(bd_rf, plot_distributions = TRUE)

## End(Not run)
```

`plot.break_down_uncertainty` *Plot Generic for Break Down Uncertainty Objects*

Description

Plot Generic for Break Down Uncertainty Objects

Usage

```
## S3 method for class 'break_down_uncertainty'
plot(
  x,
  ...,
  vcolors = DALEX::colors_breakdown_drwhy(),
  show_boxplots = TRUE,
  max_features = 10,
  max_vars = NULL
)
```

Arguments

`x`	an explanation created with `break_down_uncertainty`
`...`	other parameters.
`vcolors`	If `NA` (default), DrWhy colors are used.
`show_boxplots`	logical if `TRUE` (default) boxplot will be plotted to show uncertainty of attributions
`max_features`	maximal number of features to be included in the plot. By default it's `10`.
`max_vars`	alias for the `max_features` parameter.

Value

a `ggplot2` object.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                            data = titanic_imputed,
                            y = titanic_imputed$survived,
                            label = "glm")

sh_glm <- shap(explain_titanic_glm, titanic_imputed[1, ])

sh_glm
plot(sh_glm)

## Not run:
## Not run:
library("randomForest")
set.seed(1313)

model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                        data = HR[1:1000,1:5])

bd_rf <- break_down_uncertainty(explainer_rf,
                            new_observation,
                            path = c(3,2,4,1,5),
                            show_boxplots = FALSE)
bd_rf
plot(bd_rf, max_features = 3)

# example for regression - apartment prices
# here we do not have intreactions
model <- randomForest(m2.price ~ . , data = apartments)
explainer_rf <- explain(model,
                        data = apartments_test[1:1000,2:6],
                        y = apartments_test$m2.price[1:1000])

bd_rf <- break_down_uncertainty(explainer_rf,
                                    apartments_test[1,],
                                    path = c("floor", "no.rooms", "district",
                                        "construction.year", "surface"))
bd_rf
plot(bd_rf)

bd_rf <- shap(explainer_rf,
              apartments_test[1,])
bd_rf
plot(bd_rf)
```

```
plot(bd_rf, show_boxplots = FALSE)

## End(Not run)
```

---

plotD3 *Plot Break Down Objects in D3 with r2d3 package.*

Description

Plots waterfall break down for objects of the break_down class.

Usage

```
plotD3(x, ...)

## S3 method for class 'break_down'
plotD3(
  x,
  ...,
  baseline = NA,
  max_features = 10,
  digits = 3,
  rounding_function = round,
  bar_width = 12,
  margin = 0.2,
  scale_height = FALSE,
  min_max = NA,
  vcolors = NA,
  chart_title = NA,
  time = 0,
  max_vars = NULL,
  reload = FALSE
)
```

Arguments

x	an explanation created with break_down
...	other parameters.
baseline	if numeric then veritical line will start in baseline.
max_features	maximal number of features to be included in the plot. By default it's 10.
digits	number of decimal places (round) or significant digits (signif) to be used. See the rounding_function argument.
rounding_function	a function to be used for rounding numbers. This should be signif which keeps a specified number of significant digits or round (which is default) to have the same precision for all components.

bar_width	width of bars in px. By default it's 12px
margin	extend x axis domain range to adjust the plot. Usually value between 0.1 and 0.3, by default it's 0.2
scale_height	if TRUE, the height of the plot scales with window size
min_max	a range of OX axis. By deafult NA therefore will be extracted from the contributions of x. But can be set to some constants, usefull if these plots are used for comparisons.
vcolors	If NA (default), DrWhy colors are used.
chart_title	a character. Set custom title
time	in ms. Set the animation length
max_vars	alias for the max_features parameter.
reload	Reload the plot on resize. By default it's FALSE.

Value

a r2d3 object.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                            data = titanic_imputed,
                            y = titanic_imputed$survived,
                            label = "glm")

bd_glm <- local_attributions(explain_titanic_glm, titanic_imputed[1, ])
bd_glm
plotD3(bd_glm)

## Not run:
## Not run:
library("randomForest")

m_rf <- randomForest(status ~ . , data = HR[2:2000,])
new_observation <- HR_test[1,]
new_observation

p_fun <- function(object, newdata){predict(object, newdata=newdata, type = "prob")}

bd_rf <- local_attributions(m_rf,
```

```
                          data = HR_test,
                          new_observation =  new_observation,
                          predict_function = p_fun)

bd_rf
plotD3(bd_rf)

## End(Not run)
```

`plotD3.shap` *Plot Shap (Break Down Uncertainty) Objects in D3 with r2d3 package.*

Description

Plots Shapley values.

Usage

```
## S3 method for class 'shap'
plotD3(
  x,
  ...,
  baseline = NA,
  max_features = 10,
  digits = 3,
  rounding_function = round,
  bar_width = 12,
  margin = 0.2,
  scale_height = FALSE,
  min_max = NA,
  vcolors = NA,
  chart_title = NA,
  time = 0,
  max_vars = NULL,
  reload = FALSE
)
```

Arguments

`x`	an explanation created with `shap`
`...`	other parameters.
`baseline`	if numeric then veritical line will start in `baseline`.
`max_features`	maximal number of features to be included in the plot. By default it's `10`.
`digits`	number of decimal places (`round`) or significant digits (`signif`) to be used. See the `rounding_function` argument.

rounding_function
: a function to be used for rounding numbers. This should be signif which keeps a specified number of significant digits or round (which is default) to have the same precision for all components.

bar_width
: width of bars in px. By default it's 12px

margin
: extend x axis domain range to adjust the plot. Usually value between 0.1 and 0.3, by default it's 0.2

scale_height
: if TRUE, the height of the plot scales with window size.

min_max
: a range of OX axis. By deafult NA therefore will be extracted from the contributions of x. But can be set to some constants, usefull if these plots are used for comparisons.

vcolors
: If NA (default), DrWhy colors are used.

chart_title
: a character. Set custom title

time
: in ms. Set the animation length

max_vars
: alias for the max_features parameter.

reload
: Reload the plot on resize. By default it's FALSE.

Value

a r2d3 object.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                               data = titanic_imputed,
                               y = titanic_imputed$survived,
                               label = "glm")

s_glm <- shap(explain_titanic_glm, titanic_imputed[1, ])
s_glm
plotD3(s_glm)

## Not run:
## Not run:
library("randomForest")

HR_small <- HR[2:500,]
m_rf <- randomForest(status ~. , data = HR_small)
```

```
new_observation <- HR_test[1,]
new_observation

p_fun <- function(object, newdata){predict(object, newdata=newdata, type = "prob")}

s_rf <- shap(m_rf,
             data = HR_small[,-6],
             new_observation =  new_observation,
             predict_function = p_fun)

plotD3(s_rf, time = 500)

## End(Not run)
```

`print.break_down` *Print Generic for Break Down Objects*

Description

Print Generic for Break Down Objects

Usage

```
## S3 method for class 'break_down'
print(x, ..., digits = 3, rounding_function = round)
```

Arguments

`x`	an explanation created with `break_down`
`...`	other parameters.
`digits`	number of decimal places (round) or significant digits (signif) to be used. See the `rounding_function` argument.
`rounding_function`	a function to be used for rounding numbers. This should be `signif` which keeps a specified number of significant digits or `round` (which is default) to have the same precision for all components.

Value

a data frame

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

---

`print.break_down_description`
Print Generic for Break Down Objects

Description

Print Generic for Break Down Objects

Usage

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

Arguments

`x`	a description of `break_down_description` class.
`...`	other parameters.

Value

a character

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

---

`print.break_down_uncertainty`
Print Generic for Break Down Uncertainty Objects

Description

Print Generic for Break Down Uncertainty Objects

Usage

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

Arguments

`x`	an explanation created with `break_down_uncertainty`
`...`	other parameters.

Value

a data frame.

References

Explanatory Model Analysis. Explore, Explain and Examine Predictive Models. https://ema.drwhy.ai

Examples

```
library("DALEX")
library("iBreakDown")
set.seed(1313)
model_titanic_glm <- glm(survived ~ gender + age + fare,
                         data = titanic_imputed, family = "binomial")
explain_titanic_glm <- explain(model_titanic_glm,
                            data = titanic_imputed,
                            y = titanic_imputed$survived,
                            label = "glm")

bd_glm <- break_down_uncertainty(explain_titanic_glm, titanic_imputed[1, ])
bd_glm
plot(bd_glm)

## Not run:
## Not run:
library("randomForest")
set.seed(1313)
model <- randomForest(status ~ . , data = HR)
new_observation <- HR_test[1,]

explainer_rf <- explain(model,
                        data = HR[1:1000,1:5],
                        y = HR$status[1:1000],
                        verbose = FALSE)

bd_rf <- break_down_uncertainty(explainer_rf,
                            new_observation)
bd_rf

# example for regression - apartment prices
# here we do not have intreactions
model <- randomForest(m2.price ~ . , data = apartments)
explainer_rf <- explain(model,
                        data = apartments_test[1:1000,2:6],
                        y = apartments_test$m2.price[1:1000])

bd_rf <- break_down_uncertainty(explainer_rf, apartments_test[1,])
bd_rf

## End(Not run)
```

Index

break_down, 2, *5*, *7–10*, *13–15*, *19*, *23*
break_down_uncertainty, 4, *17*, *24*

describe, 7

explain, *3*, *5*, *10*, *12*

local_attributions, *2, 3*, *5*, 9, *13*, *15*
local_interactions, *2, 3*, *10*, 11, *15*

plot.break_down, 14
plot.break_down_uncertainty, 17
plotD3, 19
plotD3.shap, 21
print.break_down, 23
print.break_down_description, 24
print.break_down_uncertainty, 24

round, *14, 15*, *19*, *21–23*

shap, *7, 8*, *21*
shap *(*break_down_uncertainty*)*, 4
signif, *14, 15*, *19*, *21–23*