

Package: tidyrules (via r-universe)

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Type Package

Title Utilities to Retrieve Rulelists from Model Fits, Filter, Prune, Reorder and Predict on Unseen Data

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Description Provides a framework to work with decision rules. Rules can be extracted from supported models, augmented with (custom) metrics using validation data, manipulated using standard dataframe operations, reordered and pruned based on a metric, predict on unseen (test) data. Utilities include; Creating a rulelist manually, Exporting a rulelist as a SQL case statement and so on. The package offers two classes; rulelist and ruleset based on dataframe.

URL <https://github.com/talegari/tidyrules>,
<https://talegari.github.io/tidyrules/>

BugReports <https://github.com/talegari/tidyrules/issues>

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as_rulelist *as_rulelist generic from [tidyrules](#) package*

Description

as_rulelist generic

Usage

```
as_rulelist(x, ...)
```

Arguments

x object to be coerced to a [rulelist](#)
 ... for methods to use

Value

A [rulelist](#)

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

as_rulelist.data.frame
as_rulelist method for a data.frame

Description

Convert a set of rules in a dataframe to a [rulelist](#)

Usage

```
## S3 method for class 'data.frame'
as_rulelist(x, keys = NULL, model_type = NULL, estimation_type, ...)
```

Arguments

x dataframe to be coerced to a [rulelist](#)
 keys (character vector, default: NULL) column names which form the key
 model_type (string, default: NULL) Name of the model which generated the rules
 estimation_type (string) One among: 'regression', 'classification'
 ... currently unused

augment	augment is re-export of <i>generics::augment</i> from <i>tidyrules</i> package
---------	--

Description

See [augment.rulelist](#)

Usage

```
augment(x, ...)
```

Arguments

x	A rulelist
...	For methods to use

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

augment.rulelist	<i>Augment a rulelist</i>
------------------	---------------------------

Description

augment outputs a [rulelist](#) with an additional column named `augmented_stats` based on summary statistics calculated using attribute `validation_data`.

Usage

```
## S3 method for class 'rulelist'
augment(x, ...)
```

Arguments

x	A rulelist
...	(expressions) To be send to tidytable::summarise for custom aggregations. See examples.

Details

The dataframe-column `augmented_stats` will have these columns corresponding to the `estimation_type`:

- For regression: support, IQR, RMSE
- For classification: support, confidence, lift

along with custom aggregations.

Value

A [rulelist](#) with a new dataframe-column named `augmented_stats`.

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Examples

```
# Examples for augment -----
library("magrittr")

# C5 ----
att = modeldata::attrition
set.seed(100)
train_index = sample(c(TRUE, FALSE), nrow(att), replace = TRUE)

model_c5 = C50::C5.0(Attrition ~ ., data = att[train_index, ], rules = TRUE)
tidy_c5 =
  model_c5 %>%
  tidy() %>%
  set_validation_data(att[!train_index, ], "Attrition")

tidy_c5

augment(tidy_c5) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()

# augment with custom aggregator
augment(tidy_c5, output_counts = list(table(Attrition))) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()

# rpart ----
set.seed(100)
train_index = sample(c(TRUE, FALSE), nrow(iris), replace = TRUE)

model_class_rpart = rpart::rpart(Species ~ ., data = iris[train_index, ])
tidy_class_rpart = tidy(model_class_rpart) %>%
  set_validation_data(iris[!train_index, ], "Species")
tidy_class_rpart

model_regr_rpart = rpart::rpart(Sepal.Length ~ ., data = iris[train_index, ])
tidy_regr_rpart = tidy(model_regr_rpart) %>%
  set_validation_data(iris[!train_index, ], "Sepal.Length")
tidy_regr_rpart

# augment (classification case)
augment(tidy_class_rpart) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()
```

```

# augment (regression case)
augment(tidy_regr_rpart) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()

# party ----
pen = palmerpenguins::penguins %>%
  tidytable::drop_na(bill_length_mm)
set.seed(100)
train_index = sample(c(TRUE, FALSE), nrow(pen), replace = TRUE)

model_class_party = partykit::ctree(species ~ ., data = pen[train_index, ])
tidy_class_party = tidy(model_class_party) %>%
  set_validation_data(pen[!train_index, ], "species")
tidy_class_party

model_regr_party =
  partykit::ctree(bill_length_mm ~ ., data = pen[train_index, ])
tidy_regr_party = tidy(model_regr_party) %>%
  set_validation_data(pen[!train_index, ], "bill_length_mm")
tidy_regr_party

# augment (classification case)
augment(tidy_class_party) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()

# augment (regression case)
augment(tidy_regr_party) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()

# cubist ----
att = modeldata::attrition
set.seed(100)
train_index = sample(c(TRUE, FALSE), nrow(att), replace = TRUE)
cols_att = setdiff(colnames(att), c("MonthlyIncome", "Attrition"))

model_cubist = Cubist::cubist(x = att[train_index, cols_att],
                             y = att[train_index, "MonthlyIncome"]
                             )

tidy_cubist = tidy(model_cubist) %>%
  set_validation_data(att[!train_index, ], "MonthlyIncome")
tidy_cubist

augment(tidy_cubist) %>%
  tidytable::unnest(augmented_stats, names_sep = "__") %>%
  tidytable::glimpse()

```

calculate	calculate <i>is re-export of <code>generics::calculate</code> from <code>tidyrules</code> package</i>
-----------	---

Description

See [calculate.rulelist](#)

Usage

```
calculate(x, ...)
```

Arguments

x	A rulelist
...	See calculate.rulelist

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

calculate.rulelist	calculate <i>metrics for a rulelist</i>
--------------------	---

Description

Computes some metrics (based on `estimation_type`) in cumulative window function style over the rulelist (in the same order) ignoring the keys.

Usage

```
## S3 method for class 'rulelist'
calculate(x, metrics_to_exclude = NULL, ...)
```

Arguments

x	A rulelist
metrics_to_exclude	(character vector) Names of metrics to exclude
...	Named list of custom metrics. See 'details'.

Details

Default Metrics:

These metrics are calculated by default:

- `cumulative_coverage`: For `n`th rule in the rulelist, number of distinct `row_nbrs` (of `new_data`) covered by `n`th and all preceding rules (in order). In weighted case, we sum the weights corresponding to the distinct `row_nbrs`.
- `cumulative_overlap`: Up til `n`th rule in the rulelist, number of distinct `row_nbrs` (of `new_data`) already covered by some preceding rule (in order). In weighted case, we sum the weights corresponding to the distinct `row_nbrs`.

For classification:

- `cumulative_accuracy`: For `n`th rule in the rulelist, fraction of `row_nbrs` such that RHS matches the `y_name` column (of `new_data`) by `n`th and all preceding rules (in order). In weighted case, weighted accuracy is computed.

For regression:

- `cumulative_RMSE`: For `n`th rule in the rulelist, weighted RMSE of all predictions (RHS) predicted by `n`th rule and all preceding rules.

Custom metrics:

Custom metrics to be computed should be passed a named list of function(s) in `...`. The custom metric function should take these arguments in same order: `rulelist`, `new_data`, `y_name`, `weight`. The custom metric function should return a numeric vector of same length as the number of rows of `rulelist`.

Value

A dataframe of metrics with a `rule_nbr` column.

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Examples

```
library("magrittr")
model_c5 = C50::C5.0(Attrition ~., data = modeldata::attrition, rules = TRUE)
tidy_c5 = tidy(model_c5) %>%
  set_validation_data(modeldata::attrition, "Attrition") %>%
  set_keys(NULL)

# calculate default metrics (classification)
calculate(tidy_c5)

model_rpart = rpart::rpart(MonthlyIncome ~., data = modeldata::attrition)
tidy_rpart =
  tidy(model_rpart) %>%
  set_validation_data(modeldata::attrition, "MonthlyIncome") %>%
  set_keys(NULL)
```

```

# calculate default metrics (regression)
calculate(tidy_rpart)

# calculate default metrics with a custom metric
#' custom function to get cumulative MAE
library("tidytable")
get_cumulative_MAE = function(rulelist, new_data, y_name, weight){

  priority_df =
    rulelist %>%
    select(rule_nbr) %>%
    mutate(priority = 1:nrow(rulelist)) %>%
    select(rule_nbr, priority)

  pred_df =
    predict(rulelist, new_data) %>%
    left_join(priority_df, by = "rule_nbr") %>%
    mutate(weight = local(weight)) %>%
    select(rule_nbr, row_nbr, weight, priority)

  new_data2 =
    new_data %>%
    mutate(row_nbr = 1:n()) %>%
    select(all_of(c("row_nbr", y_name)))

  rmse_till_rule = function(rn){

    if (is.character(rulelist$RHS)) {
      inter_df =
        pred_df %>%
        tidytable::filter(priority <= rn) %>%
        left_join(mutate(new_data, row_nbr = 1:n()), by = "row_nbr") %>%
        left_join(select(rulelist, rule_nbr, RHS), by = "rule_nbr") %>%
        nest(.by = c("RHS", "rule_nbr", "row_nbr", "priority", "weight")) %>%
        mutate(RHS = purrr::map2_dbl(RHS,
                                     data,
                                     ~ eval(parse(text = .x), envir = .y)
                                    )
              ) %>%
        unnest(data)
    } else {

      inter_df =
        pred_df %>%
        tidytable::filter(priority <= rn) %>%
        left_join(new_data2, by = "row_nbr") %>%
        left_join(select(rulelist, rule_nbr, RHS), by = "rule_nbr")
    }

    inter_df %>%
    summarise(rmse = MetricsWeighted::mae(RHS,
                                          .data[[y_name]],
                                          weight,

```

```

                                na.rm = TRUE
                                )
                                ) %>%
  `[[`("rmse")
}

res = purrr::map_dbl(1:nrow(rulelist), rmse_till_rule)
return(res)
}

calculate(tidy_rpart,
          metrics_to_exclude = NULL,
          list("cumulative_mae" = get_cumulative_MAE)
          )

```

convert_rule_flavor *Convert a R parsable rule to python/sql parsable rule*

Description

Convert a R parsable rule to python/sql parsable rule

Usage

```
convert_rule_flavor(rule, flavor)
```

Arguments

rule (chr vector) R parsable rule(s)
 flavor (string) One among: 'python', 'sql'

Value

(chr vector) of rules

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [to_sql_case](#)

Other Auxiliary Rulelist Utility: [to_sql_case\(\)](#)

package_tidyrules	tidyrules
-------------------	-----------

Description

tidyrules package provides a framework to work with decision rules. Rules can be extracted from supported models using [tidy](#), augmented using validation data by [augment](#), manipulated using standard dataframe operations, (modified) rulelists can be used to [predict](#) on unseen (test) data. Utilities include: Create a rulelist manually ([as_rulelist](#)), Export a rulelist to SQL ([to_sql_case](#)) and so on. The package offers two classes; [rulelist](#) and [ruleset](#) based on dataframe.

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See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#)

plot.prune_rulelist	<i>Plot method for prune_rulelist class</i>
---------------------	---

Description

Plot method for prune_rulelist class

Usage

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

Arguments

x	A 'prune_rulelist' object
...	unused

Value

ggplot2 object (invisibly)

plot.rulelist	<i>Plot method for rulelist</i>
---------------	---------------------------------

Description

Plots a heatmap with rule_nbr's on x-side and clusters of row_nbr's on y-side of a binary matrix with 1 if a rule is applicable for a row.

Usage

```
## S3 method for class 'rulelist'
plot(x, thres_cluster_rows = 1000, dist_metric = "jaccard", ...)
```

Arguments

x	A rulelist
thres_cluster_rows	(positive integer) Maximum number of rows beyond which a x-side dendrogram is not computed
dist_metric	(string or function, default: "jaccard") Distance metric for y-side (rule_nbr) passed to method argument of proxy::dist
...	Arguments to be passed to pheatmap::pheatmap

Details

Number of clusters is set to min(number of unique rows in the row_nbr X rule_nbr matrix and thres_cluster_rows)

Examples

```
library("magrittr")
att = modeldata::attrition
tidy_c5 =
  C50::C5.0(Attrition ~., data = att, rules = TRUE) %>%
  tidy() %>%
  set_validation_data(att, "Attrition") %>%
  set_keys(NULL)

plot(tidy_c5)
```

predict.rulelist predict *method for a rulelist*

Description

Predicts rule_nbr applicable (as per the order in rulelist) for a row_nbr (per key) in new_data

Usage

```
## S3 method for class 'rulelist'
predict(object, new_data, multiple = FALSE, ...)
```

Arguments

object	A rulelist
new_data	(dataframe)
multiple	(flag, default: FALSE) Whether to output all rule numbers applicable for a row. If FALSE, the first satisfying rule is provided.
...	unused

Details

If a row_nbr is covered more than one rule_nbr per 'keys', then rule_nbr appearing earlier (as in row order of the [rulelist](#)) takes precedence.

Output Format:

- When multiple is FALSE(default), output is a dataframe with three or more columns: row_number (int), columns corresponding to 'keys', rule_nbr (int).
- When multiple is TRUE, output is a dataframe with three or more columns: row_number (int), columns corresponding to 'keys', rule_nbr (list column of integers).
- If a row number and 'keys' combination is not covered by any rule, then rule_nbr column has missing value.

Value

A dataframe. See **Details**.

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Examples

```

model_c5 = C50::C5.0(species ~.,
                    data = palmerpenguins::penguins,
                    trials = 5,
                    rules = TRUE
                    )
tidy_c5 = tidy(model_c5)
tidy_c5

output_1 = predict(tidy_c5, palmerpenguins::penguins)
output_1 # different rules per 'keys' (`trial_nbr` here)

output_2 = predict(tidy_c5, palmerpenguins::penguins, multiple = TRUE)
output_2 # `rule_nbr` is a list-column of integer vectors

```

predict.ruleset	predict <i>method for a ruleset</i>
-----------------	---

Description

Predicts multiple rule_nbr(s) applicable for a row_nbr (per key) in new_data

Usage

```

## S3 method for class 'ruleset'
predict(object, new_data, ...)

```

Arguments

object	A ruleset
new_data	(dataframe)
...	unused

Value

A dataframe with three or more columns: row_number (int), columns corresponding to 'keys', rule_nbr (list column of integers). If a row number and 'keys' combination is not covered by any rule, then rule_nbr column has missing value.

See Also

[predict.rulelist](#)

Examples

```

model_c5 = C50::C5.0(species ~.,
                    data = palmerpenguins::penguins,
                    trials = 5,
                    rules = TRUE
                    )
tidy_c5_ruleset = as_ruleset(tidy(model_c5))
tidy_c5_ruleset

predict(tidy_c5_ruleset, palmerpenguins::penguins)

```

```
print.prune_rulelist Print method for prune_rulelist class
```

Description

Print method for `prune_rulelist` class

Usage

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

Arguments

<code>x</code>	A 'prune_rulelist' object
<code>...</code>	unused

```
print.rulelist Print method for rulelist class
```

Description

Prints [rulelist](#) attributes and first few rows.

Usage

```
## S3 method for class 'rulelist'
print(x, banner = TRUE, ...)
```

Arguments

<code>x</code>	A rulelist object
<code>banner</code>	(flag, default: TRUE) Should the banner be displayed
<code>...</code>	Passed to <code>tidytable::print</code>

Value

input [rulelist](#) (invisibly)

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

print.ruleset	<i>Print method for ruleset class</i>
---------------	---------------------------------------

Description

Prints the ruleset object

Usage

```
## S3 method for class 'ruleset'  
print(x, banner = TRUE, ...)
```

Arguments

x	A rulelist
banner	(flag, default: TRUE) Should the banner be displayed
...	Passed to <code>print.rulelist</code>

Value

(invisibly) Returns the ruleset object

See Also

[print.rulelist](#)

Examples

```
model_class_party = partykit::ctree(species ~ .,  
                                   data = palmerpenguins::penguins  
                                   )  
as_ruleset(tidy(model_class_party))
```

prune	prune is re-export of <i>generics::prune</i> from <i>tidyrules</i> package
-------	--

Description

See [prune.rulelist](#)

Usage

```
prune(tree, ...)
```

Arguments

tree	A rulelist
...	See prune.rulelist

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

prune.rulelist	prune rules of a <i>rulelist</i>
----------------	----------------------------------

Description

Prune the [rulelist](#) by suggesting to keep first 'k' rules based on metrics computed by [calculate](#)

Usage

```
## S3 method for class 'rulelist'
prune(
  tree,
  metrics_to_exclude = NULL,
  stop_expr_string = "relative__cumulative_coverage >= 0.9",
  min_n_rules = 1,
  ...
)
```

Arguments

tree	A rulelist
metrics_to_exclude	(character vector or NULL) Names of metrics not to be calculated. See calculate for the list of default metrics.
stop_expr_string	(string default: "relative__cumulative_coverage >= 0.9") Parsable condition
min_n_rules	(positive integer) Minimum number of rules to keep
...	Named list of custom metrics passed to calculate

Details

1. Metrics are computed using `calculate`.
2. Relative metrics (prepended by `'relative__'`) are calculated by dividing each metric by its max value.
3. The first rule in rulelist order which meets the `'stop_expr_string'` criteria is stored (say `'pos'`). Print method suggests to keep rules until `pos`.

Value

Object of class `'prune_ruleslist'` with these components: 1. `pruned`: ruleset keeping only first `'pos'` rows. 2. `n_pruned_rules`: `pos`. If stop criteria is never met, then `pos = nrow(ruleset)` 3. `n_total_rules`: `nrow(ruleset)`, 4. `metrics_df`: Dataframe with metrics and relative metrics 5. `stop_expr_string`

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Examples

```
library("magrittr")
model_c5 = C50::C5.0(Attrition ~., data = modeldata::attrition, rules = TRUE)
tidy_c5 = tidy(model_c5) %>%
  set_validation_data(modeldata::attrition, "Attrition") %>%
  set_keys(NULL)

#' prune with defaults
prune_obj = prune(tidy_c5)
#' note that all other metrics are visible in the print output
prune_obj
plot(prune_obj)
prune_obj$pruned

#' prune with a different stop_expr_string threshold
prune_obj = prune(tidy_c5,
  stop_expr_string = "relative__cumulative_coverage >= 0.2"
)
prune_obj #' as expected, has smaller then 10 rules as compared to default args
plot(prune_obj)
prune_obj$pruned

#' prune with a different stop_expr_string metric
st = "relative__cumulative_overlap <= 0.7 & relative__cumulative_overlap > 0"
prune_obj = prune(tidy_c5, stop_expr_string = st)
prune_obj #' as expected, has smaller then 10 rules as compared to default args
plot(prune_obj)
prune_obj$pruned
```

reorder	<i>reorder generic</i>
---------	------------------------

Description

reorder generic for rulelist

Usage

```
reorder(x, ...)
```

Arguments

x	A rulelist
...	See reorder.rulelist

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

reorder.rulelist	<i>Reorder the rules/rows of a rulelist</i>
------------------	---

Description

Implements a greedy strategy to add one rule at a time which maximizes/minimizes a metric.

Usage

```
## S3 method for class 'rulelist'
reorder(x, metric = "cumulative_coverage", minimize = FALSE, init = NULL, ...)
```

Arguments

x	A rulelist
metric	(character vector or named list) Name of metrics or a custom function(s). See calculate . The 'n+1'th metric is used when there is a match at 'nth' level, similar to base::order . If there is a match at final level, row order of the rulelist comes into play.
minimize	(logical vector) Whether to minimize. Either TRUE/FALSE or a logical vector of same length as metric
init	(positive integer) Initial number of rows after which reordering should begin
...	passed to calculate

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Examples

```
library("magrittr")
att = modeldata::attrition
tidy_c5 =
  C50::C5.0(Attrition ~., data = att, rules = TRUE) %>%
  tidy() %>%
  set_validation_data(att, "Attrition") %>%
  set_keys(NULL) %>%
  head(5)

# with defaults
reorder(tidy_c5)

# use 'cumulative_overlap' to break ties (if any)
reorder(tidy_c5, metric = c("cumulative_coverage", "cumulative_overlap"))

# reorder after 2 rules
reorder(tidy_c5, init = 2)
```

rulelist

Rulelist

Description**Structure:**

A `rulelist` is ordered list of rules stored as a dataframe. Each row, specifies a rule (LHS), expected outcome (RHS) and some other details.

It has these mandatory columns:

- `rule_nbr`: (integer vector) Rule number
- LHS: (character vector) A rule is a string that can be parsed using `base::parse()`
- RHS: (character vector or a literal)

Example:

rule_nbr	LHS	RHS	support	confidence	lift
1	(island %in% c('Biscoe')) & (flipper_length_mm > 203)	Gentoo	122	1.000000	1.000000
2	(island %in% c('Biscoe')) & (flipper_length_mm <= 203)	Adelie	46	0.956521	0.956521
3	(island %in% c('Dream', 'Torgersen')) & (bill_length_mm > 44.1)	Chinstrap	65	0.953	0.953
4	(island %in% c('Dream', 'Torgersen')) & (bill_length_mm <= 44.1)	Adelie	111	0.945	0.945

Create a rulelist:

A `rulelist` can be created using `tidy()` on some supported model fits (`run: utils::methods(tidy)`).

It can also be created manually from a existing dataframe using `as_rulelist`.

Keys and attributes:

Columns identified as 'keys' along with `rule_nbr` form a unique combination – a group of rules. For example, rule-based C5 model with multiple trials creates rules per each `trial_nbr`. `predict` method understands 'keys', thereby provides/predicts a rule number (for each row in new data / test data) within the same `trial_nbr`.

A `rulelist` has these mandatory attributes:

- `estimation_type`: One among regression, classification
- `keys`: (character vector) Names of the column that forms a key.
- `model_type`: (string) Name of the model

A `rulelist` has these optional attributes:

Set Validation data:

This helps a few methods like [augment](#), [calculate](#), [prune](#), [reorder](#) require few additional attributes which can be set using [set_validation_data](#).

Methods for rulelist:

1. [Predict](#): Given a dataframe (possibly without a dependent variable column aka 'test data'), predicts the first rule (as ordered in the `rulelist`) per 'keys' that is applicable for each row. When `multiple = TRUE`, returns all rules applicable for a row (per key).
2. [Augment](#): Outputs summary statistics per rule over validation data and returns a `rulelist` with a new dataframe-column.
3. [Calculate](#): Computes metrics for a `rulelist` in a cumulative manner such as `cumulative_coverage`, `cumulative_overlap`, `cumulative_accuracy`.
4. [Prune](#): Suggests pruning a `rulelist` such that some expectation are met (based on metrics). Example: `cumulative_coverage` of 80% can be met with a first few rules.
5. [Reorder](#): Reorders a `rulelist` in order to maximize a metric.

Manipulating a rulelist:

`Rulelists` are essentially dataframes. Hence, any dataframe operations which preferably preserve attributes will output a `rulelist`. [as_rulelist](#) and [as.data.frame](#) will help in moving back and forth between `rulelist` and dataframe worlds.

Utilities for a rulelist:

1. [as_rulelist](#): Create a `rulelist` from a dataframe with some mandatory columns.
2. [set_keys](#): Set or Unset 'keys' of a `rulelist`.
3. [to_sql_case](#): Outputs a SQL case statement for a `rulelist`.
4. [convert_rule_flavor](#): Converts R-parsable rule strings to python/SQL parsable rule strings.

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

ruleset

Ruleset

Description

`ruleset` class is a piggyback class that inherits [rulelist](#) class for convenience of [print](#) and [predict](#) methods.

set_keys	<i>Set keys for a rulelist</i>
----------	--

Description

'keys' are a set of column(s) which identify a group of rules in a [rulelist](#). Methods like [predict](#), [augment](#) produce output per key combination.

Usage

```
set_keys(x, keys, reset = FALSE)
```

Arguments

x	A rulelist
keys	(character vector or NULL)
reset	(flag) Whether to reset the keys to sequential numbers starting with 1 when keys is set to NULL

Details

A new [rulelist](#) is returned with attr keys is modified. The input [rulelist](#) object is unaltered.

Value

A [rulelist](#) object

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Other Core Rulelist Utility: [set_validation_data\(\)](#)

Examples

```
model_c5 = C50::C5.0(Attrition ~., data = modeldata::attrition, rules = TRUE)
tidy_c5 = tidy(model_c5)
tidy_c5 # keys are: "trial_nbr"

tidy_c5[["rule_nbr"]] = 1:nrow(tidy_c5)
new_tidy_c5 = set_keys(tidy_c5, NULL) # remove all keys
new_tidy_c5

new_2_tidy_c5 = set_keys(new_tidy_c5, "trial_nbr") # set "trial_nbr" as key
new_2_tidy_c5

# Note that `tidy_c5` and `new_tidy_c5` are not altered.
tidy_c5
new_tidy_c5
```

set_validation_data *Add validation_data to a [rulelist](#)*

Description

Returns a [rulelist](#) with three new attributes set: `validation_data`, `y_name` and `weight`. Methods such as [augment](#), [calculate](#), [prune](#), [reorder](#) require this to be set.

Usage

```
set_validation_data(x, validation_data, y_name, weight = 1)
```

Arguments

<code>x</code>	A rulelist
<code>validation_data</code>	(dataframe) Data to used for computing some metrics. It is expected to contain <code>y_name</code> column.
<code>y_name</code>	(string) Name of the dependent variable column.
<code>weight</code>	(non-negative numeric vector, default: 1) Weight per observation/row of <code>validation_data</code> . This is expected to have same length as the number of rows in <code>validation_data</code> . Only exception is when it is a single positive number, which means that all rows have equal weight.

Value

A [rulelist](#) with some extra attributes set.

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Other Core Rulelist Utility: [set_keys\(\)](#)

Examples

```
att = modeldata::attrition
set.seed(100)
index = sample(c(TRUE, FALSE), nrow(att), replace = TRUE)
model_c5 = C50::C5.0(Attrition ~., data = att[index, ], rules = TRUE)

tidy_c5 = tidy(model_c5)
tidy_c5

tidy_c5_2 = set_validation_data(tidy_c5,
                               validation_data = att[!index, ],
                               y_name = "Attrition",
                               weight = 1 # default
                              )
```



```
tidy_c5_2
tidy_c5 # not altered
```

tidy	<i>tidy is re-export of <code>generics::tidy</code> from <code>tidyrules</code> package</i>
------	---

Description

tidy applied on a supported model fit creates a [rulelist](#). **See Also** section links to documentation of specific methods.

Usage

```
tidy(x, ...)
```

Arguments

x	A supported model object
...	For model specific implementations to use

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Other Core Tidy Utility: [tidy.C5.0\(\)](#), [tidy.cubist\(\)](#), [tidy.rpart\(\)](#)

tidy.C5.0	<i>Get the rulelist from a C5 model</i>
-----------	---

Description

Each row corresponds to a rule per trial_nbr

Usage

```
## S3 method for class 'C5.0'
tidy(x, ...)
```

Arguments

x	C50::C5.0 model fitted with rules = TRUE
...	Other arguments (See details)

Details

- The output columns are: rule_nbr, trial_nbr, LHS, RHS, support, confidence, lift.
- Rules per trial_nbr are sorted in this order: desc(confidence), desc(lift), desc(support).

Optional named arguments:

- laplace (flag, default: TRUE) is supported. This computes confidence with laplace correction as documented under 'Rulesets' here: [C5 doc](#).

Value

A [rulelist](#) object

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Other Core Tidy Utility: [tidy\(\)](#), [tidy.cubist\(\)](#), [tidy.rpart\(\)](#)

Examples

```
model_c5 = C50::C5.0(Attrition ~., data = modeldata::attrition, rules = TRUE)
tidy(model_c5)
```

`tidy.constparty`

Get the [rulelist](#) from a [party](#) model

Description

Each row corresponds to a rule

Usage

```
## S3 method for class 'constparty'
tidy(x, ...)
```

Arguments

`x` [partykit::party](#) model typically built using [partykit::ctree](#)
`...` Other arguments (currently unused)

Details

These types of [party](#) models are supported: regression (y is numeric), classification (y is factor)

For [party](#) classification model:

- Output columns are: rule_nbr, LHS, RHS, support, confidence, lift, terminal_node_id.
- Rules are sorted in this order: desc(confidence), desc(lift), desc(support).

For [party](#) regression model:

- Output columns are: rule_nbr, LHS, RHS, support, IQR, RMSE, terminal_node_id.
- Rules are sorted in this order: RMSE, desc(support).

Value

A [rulelist](#) object

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Examples

```
pen = palmerpenguins::penguins
model_class_party = partykit::ctree(species ~ ., data = pen)
tidy(model_class_party)
model_regr_party = partykit::ctree(bill_length_mm ~ ., data = pen)
tidy(model_regr_party)
```

tidy.cubist

Get the [rulelist](#) from a [cubist](#) model

Description

Each row corresponds to a rule per committee

Usage

```
## S3 method for class 'cubist'
tidy(x, ...)
```

Arguments

x [Cubist::cubist](#) model
... Other arguments (currently unused)

Details

- The output columns are: rule_nbr, committee, LHS, RHS, support, mean, min, max, error.
- Rules are sorted in this order per committee: error, desc(support)

Value

A [rulelist](#) object

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [calculate](#), [prune](#), [reorder](#)

Other Core Tidy Utility: [tidy\(\)](#), [tidy.C5.0\(\)](#), [tidy.rpart\(\)](#)

Examples

```
att = modeldata::attrition
cols_att = setdiff(colnames(att), c("MonthlyIncome", "Attrition"))
model_cubist = Cubist::cubist(x = att[, cols_att],
                             y = att[["MonthlyIncome"]]
                             )
tidy(model_cubist)
```

tidy.rpart

Get the [rulelist](#) from a [rpart](#) model

Description

Each row corresponds to a rule

Usage

```
## S3 method for class 'rpart'
tidy(x, ...)
```

Arguments

x [rpart::rpart](#) model
... Other arguments (currently unused)

Details

For `rpart` rules, one should build the model without `ordered factor` variable. We recommend you to convert `ordered factor` to `factor` or `integer` class.

For `rpart::rpart` classification model:

- Output columns are: `rule_nbr`, LHS, RHS, `support`, `confidence`, `lift`.
- The rules are sorted in this order: `desc(confidence)`, `desc(lift)`, `desc(support)`.

For `rpart::rpart` regression(anova) model:

- Output columns are: `rule_nbr`, LHS, RHS, `support`.
- The rules are sorted in this order: `desc(support)`.

Value

A `rulelist` object

See Also

`rulelist`, `tidy`, `augment`, `predict`, `calculate`, `prune`, `reorder`

Other Core Tidy Utility: `tidy()`, `tidy.C5.0()`, `tidy.cubist()`

Examples

```
model_class_rpart = rpart::rpart(Species ~ ., data = iris)
tidy(model_class_rpart)
```

```
model_regr_rpart = rpart::rpart(Sepal.Length ~ ., data = iris)
tidy(model_regr_rpart)
```

to_sql_case

Extract SQL case statement from a `rulelist`

Description

Extract SQL case statement from a `rulelist`

Usage

```
to_sql_case(rulelist, rhs_column_name = "RHS", output_colname = "output")
```

Arguments

`rulelist` A `rulelist` object

`rhs_column_name`

(string, default: "RHS") Name of the column in the `rulelist` to be used as RHS (WHEN some_rule THEN rhs) in the sql case statement

`output_colname` (string, default: "output") Name of the output column created by the SQL statement (used in case ... AS output_column)

Details

As a side-effect, the SQL statement is cat to stdout. The output contains newline character.

Value

(string invisibly) SQL case statement

See Also

[rulelist](#), [tidy](#), [augment](#), [predict](#), [convert_rule_flavor](#)

Other Auxiliary Rulelist Utility: [convert_rule_flavor\(\)](#)

Examples

```
model_c5 = C50::C5.0(Attrition ~., data = modeldata::attrition, rules = TRUE)
tidy(model_c5)
to_sql_case(tidy(model_c5))
```

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