

Package ‘OneR’

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Type Package

Title One Rule Machine Learning Classification Algorithm with Enhancements

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Author Holger von Jouanne-Diedrich

Maintainer Holger von Jouanne-Diedrich <holger.jouanne-diedrich@h-ab.de>

Description Implements the One Rule (OneR) Machine Learning classification algorithm with enhancements for sophisticated handling of numeric data and missing values together with extensive diagnostic functions. It is useful as a baseline for machine learning models and the rules are often helpful heuristics.

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URL <http://vonjd.github.io/OneR/>

BugReports <http://github.com/vonjd/OneR/issues>

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bin	<i>Binning function</i>
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Description

Discretizes all numerical data in a dataframe into categorical bins of equal length or content or based on automatically determined clusters.

Usage

```
bin(data, nbins = 5, labels = NULL, method = c("length", "content",  
      "clusters"), na.omit = TRUE)
```

Arguments

data	dataframe which contains the data.
nbins	number of bins (= levels).
labels	character vector of labels for the resulting category.
method	a character string specifying the binning method, see 'Details'; can be abbreviated.
na.omit	logical value whether instances with missing values should be removed.

Details

Character strings and logical strings are coerced into factors. Matrices are coerced into dataframes. When called with a single vector only the respective factor (and not a dataframe) is returned. Method "length" gives intervals of equal length, method "content" gives intervals of equal content (via quantiles). Method "clusters" determines "nbins" clusters via 1D kmeans with deterministic seeding of the initial cluster centres (Jenks natural breaks optimization).

When "na.omit = FALSE" an additional level "NA" is added to each factor with missing values.

Value

A dataframe or vector.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#), [optbin](#)

Examples

```

data <- iris
str(data)
str(bin(data))
str(bin(data, nbins = 3))
str(bin(data, nbins = 3, labels = c("small", "medium", "large")))

## Difference between methods "length" and "content"
set.seed(1); table(bin(rnorm(900), nbins = 3))
set.seed(1); table(bin(rnorm(900), nbins = 3, method = "content"))

## Method "clusters"
intervals <- paste(levels(bin(faithful$waiting, nbins = 2, method = "cluster")), collapse = " ")
hist(faithful$waiting, main = paste("Intervals:", intervals))
abline(v = c(42.9, 67.5, 96.1), col = "blue")

## Missing values
bin(c(1:10, NA), nbins = 2, na.omit = FALSE) # adds new level "NA"
bin(c(1:10, NA), nbins = 2)                 # omits missing values by default (with warning)

```

eval_model

Classification Evaluation function

Description

Function for evaluating a OneR classification model. Prints prediction vs. actual in absolute and relative numbers. Additionally it gives the accuracy and error rate.

Usage

```
eval_model(prediction, actual)
```

Arguments

prediction	vector which contains the predicted values.
actual	dataframe which contains the actual data. When there is more than one column the last last column is taken. A single vector is allowed too.

Value

Invisibly returns a list with the number of correctly classified and total instances and a confusion matrix with the absolute numbers.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

Examples

```
data <- iris
model <- OneR(data)
summary(model)
prediction <- predict(model, data)
eval_model(prediction, data)
```

is.OneR

Test OneR model objects

Description

Test if object is a OneR model.

Usage

```
is.OneR(x)
```

Arguments

x object to be tested.

Value

a logical whether object is of class "OneR".

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

Examples

```
model <- OneR(iris)
is.OneR(model) # evaluates to TRUE
```

maxlevels	<i>Remove factors with too many levels</i>
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Description

Removes all columns of a dataframe where a factor (or character string) has more than a maximum number of levels.

Usage

```
maxlevels(data, maxlevels = 20, na.omit = TRUE)
```

Arguments

data	dataframe which contains the data.
maxlevels	number of maximum factor levels.
na.omit	logical value whether missing values should be treated as a level, defaults to omit missing values before counting.

Details

Often categories that have very many levels are not useful in modelling OneR rules because they result in too many rules and tend to overfit. Examples are IDs or names.

Character strings are treated as factors although they keep their datatype. Numeric data is left untouched.

Value

A dataframe.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#)

Examples

```
df <- data.frame(numeric = c(1:26), alphabet = letters)
str(df)
str(maxlevels(df))
```

OneR

One Rule function

Description

Builds a model according to the One Rule (OneR) machine learning classification algorithm.

Usage

```
OneR(data, formula = NULL, ties.method = c("first", "chisq"),  
      verbose = FALSE)
```

Arguments

<code>data</code>	dataframe, which contains the data. When <code>formula = NULL</code> (the default) the last column must be the target variable.
<code>formula</code>	formula interface for the OneR function.
<code>ties.method</code>	a character string specifying how ties are treated, see 'Details'; can be abbreviated.
<code>verbose</code>	If TRUE prints rank, names and predictive accuracy of the attributes in decreasing order (with <code>ties.method = "first"</code>).

Details

All numerical data is automatically converted into five categorical bins of equal length. Instances with missing values are removed. This is done by internally calling the default version of `bin` before starting the OneR algorithm. To finetune this behaviour data preprocessing with the `bin` or `optbin` functions should be performed.

When there is more than one attribute with best performance either the first (from left to right) is being chosen (method "first") or the one with the lowest p-value of a chi-squared test (method "chisq").

Value

Returns an object of class "OneR". Internally this is a list consisting of the function call with the specified arguments, the names of the target and feature variables, a list of the rules, the number of correctly classified and total instances and the contingency table of the best predictor vs. the target variable.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[bin](#), [optbin](#), [eval_model](#), [maxlevels](#)

Examples

```
data <- optbin(iris)
model <- OneR(data, verbose = TRUE)
summary(model)
plot(model)
prediction <- predict(model, data)
eval_model(prediction, data)

## The same with the formula interface:
data <- optbin(iris)
model <- OneR(formula = Species ~., data = data, verbose = TRUE)
summary(model)
plot(model)
prediction <- predict(model, data)
eval_model(prediction, data)
```

optbin

Optimal Binning function

Description

Discretizes all numerical data in a dataframe into categorical bins where the cut points are optimally aligned with the target categories, thereby a factor is returned. When building a OneR model this could result in fewer rules with enhanced accuracy.

Usage

```
optbin(data, formula = NULL, method = c("logreg", "naive"),
       na.omit = TRUE)
```

Arguments

data	dataframe which contains the data. When formula = NULL (the default) the last column must be the target variable.
formula	formula interface for the optbin function.
method	a character string specifying the method for optimal binning, see 'Details'; can be abbreviated.
na.omit	logical value whether instances with missing values should be removed.

Details

The cutpoints are calculated by pairwise logistic regressions (method "logreg") or as the means of the expected values of the respective classes ("naive"). The function is likely to give unsatisfactory results when the distributions of the respective classes are not (linearly) separable. Method "naive" should only be used when distributions are (approximately) normal, although in this case "logreg" should give comparable results, so it is the preferable (and therefore default) method.

Character strings and logical strings are coerced into factors. Matrices are coerced into dataframes. If the target is numeric it is turned into a factor with the number of levels equal to the number of values. Additionally a warning is given.

When "na.omit = FALSE" an additional level "NA" is added to each factor with missing values.

Value

A dataframe with the target variable being in the last column.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#), [bin](#)

Examples

```
data <- iris # without optimal binning
model <- OneR(data, verbose = TRUE)
summary(model)

data_opt <- optbin(iris) # with optimal binning
model_opt <- OneR(data_opt, verbose = TRUE)
summary(model_opt)

## The same with the formula interface:
data_opt <- optbin(formula = Species ~., data = iris)
model_opt <- OneR(data_opt, verbose = TRUE)
summary(model_opt)
```

`plot.OneR`*Plot Diagnostics for an OneR object*

Description

Plots a mosaic plot for the feature attribute and the target of the OneR model.

Usage

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

Arguments

`x` object of class "OneR".
`...` further arguments passed to or from other methods.

Details

If more than 20 levels are present for either the feature attribute or the target the function stops with an error.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#)

Examples

```
model <- OneR(iris)  
plot(model)
```

`predict.OneR`*Predict method for OneR models*

Description

Predict values based on OneR model object.

Usage

```
## S3 method for class 'OneR'  
predict(object, newdata, ...)
```

Arguments

<code>object</code>	object of class "OneR".
<code>newdata</code>	dataframe in which to look for the feature variable with which to predict.
<code>...</code>	further arguments passed to or from other methods.

Details

`newdata` can have the same format as used for building the model but must at least have the feature variable that is used in the OneR rules. If cases appear that were not present when building the model the predicted value is UNSEEN.

Value

A named vector.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#)

Examples

```
model <- OneR(iris)  
prediction <- predict(model, iris[1:4])  
eval_model(prediction, iris[5])
```

print.OneR	<i>Print OneR models</i>
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Description

print method for class OneR.

Usage

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

Arguments

x	object of class "OneR".
...	further arguments passed to or from other methods.

Details

Prints the rules and the accuracy of an OneR model.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#)

Examples

```
model <- OneR(iris)  
print(model)
```

`summary.OneR`*Summarize OneR models*

Description

summary method for class OneR.

Usage

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

Arguments

`object` object of class "OneR".
`...` further arguments passed to or from other methods.

Details

Prints the rules of the OneR model, the accuracy, a contingency table of the feature attribute and the target and performs a chi-squared test on this table.

In the contingency table the maximum values in each column are highlighted by adding a '*', thereby representing the rules of the OneR model.

Author(s)

Holger von Jouanne-Diedrich

References

<http://vonjd.github.io/OneR/>

See Also

[OneR](#)

Examples

```
model <- OneR(iris)  
summary(model)
```

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