Package 'mars'

April 11, 2022

Version 0.0.0.88888888

Title Multivariate Adaptive Regression Splines (MARS)

Author Siyul Sam Byun, So Yeon Park, Dawu Liu

Maintainer Siyul Sam Byun <siyulb@sfu.ca>
So Yeon Park <syp7@sfu.ca>
Dawu Liu <dla189@sfu.ca>

Description Build regression models using the techniques in Friedman's paper ``Multivariate Adaptive Regression Splines".

References Jerame H. Friedman. ``Multivariate Adaptive Regression Splines." Ann, Statist. 19 (1) 1 - 67, March, 1991 \url{https://doi.org/10.1214/aos/1176347963}

Example test <- mars(y~x1+x2, data=mars::marstestdata, control=mars.control(Mmax=2))

License GPL (>= 3)

Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.1.2

Imports stats,
graphics

Suggests knitr,
rmarkdown,
testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

Depends R (>= 3.5.0)

R topics documented:

`mars` *Multivariate Adaptive Regression Splines (MARS)*

Description

MARS (Multivariate Adaptive Regression Splines) is a regression analysis that automatically splits and better linear fit into non-linear models.

Usage

```
mars(formula, data, control=NULL, ...)
```

Arguments

`formula`	an R formula
`data`	a data frame containing the data
`control`	an object of class 'mars.control'
`...`	further arguments

Details

MARS - forward stepwise algorithm: Forward stepwise fits the data nicely by adjusting the coefficient values as well as deriving a proper set of basis functions. Forward stepwise produces basis functions which do not have zero pairwise product expectations. The advantage of this is that basis functions, except for B0, can be removed without leaving a hole in the predictor space.

MARS - backward stepwise algorithm: Jstar(J*) backward stepwise is all of the basis function set and derived from forward stepwise. One basis function is deleted at each iteration of the outer loop, while the inner loop chooses which one to be deleted. The chosen basis function to be deleted is either the one improving the model by its removal or degrading the model the least by the removal. Constant basis function B0(x) = 1 is not considered for elimination. A sequence of (Mmax - 1) models is what is constructed from backward stepwise, and the current sequence has one less basis function than that of the previous sequence. Once the iteration is terminated, the users are left with the best model.

Value

an S3 object of class mars that includes the final regression model and a description of the basis functions which are constructed by the hinge functions

Author(s)

Siyul Sam Byun, So Yeon Park, Dawu Liu

References

Jerame H. Friedman. "Multivariate Adaptive Regression Splines." Ann, Statist. 19 (1) 1 - 67, March, 1991 https://doi.org/10.1214/aos/1176347963

See Also

plot.mars for plotting the basis functions of the mars object

predict.mars for making predictions on a new data using the mars object

summary.mars for summarizing the mars object

print.mars for printing the mars object

Examples

```
test <- mars(y~x1+x2, data=mars::marstestdata, control=mars.control(Mmax=2))
```

`mars.control` *Constructor for 'mars.control' objects*

Description

This function constructs a 'mars.control' object that specifies parameters used in the model fitting procedure.

Usage

```
mars.control(Mmax = 2, d = 3, trace = FALSE)
```

Arguments

`Mmax`	A maximum even integer of basis functions. Default value is 2.
`d`	A smoothing parameter for the generalized cross-validation. Default value is 3.
`trace`	A logical value

Value

a `mars.control` object

Examples

```
test <- mars.control(Mmax = 10)
```

marstestdata *marstestdata*

Description

A dataset for testing purpose

Usage

```
marstestdata
```

Format

A data frame with 100 rows and 11 variables:

y response variable

x1 explanatory variable

x2 explanatory variable

x3 explanatory variable

x4 explanatory variable

x5 explanatory variable

x6 explanatory variable

x7 explanatory variable

x8 explanatory variable

x9 explanatory variable

x10 explanatory variable

plot.mars *Plots a mars object*

Description

Plots basis functions that are constructed with a single explanatory variable or two explanatory variables

Usage

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

Arguments

x	a mars object
...	further arguments

See Also

Other methods: `predict.mars()`, `print.mars()`, `summary.mars()`

Examples

```
mar <- mars(y~x1+x2+x3, data=mars::marstestdata, control=mars.control(Mmax=6))
plot(x=mar)
```

---

predict.mars *Predicted values based on mars object.*

Description

Predicted values based on mars object.

Usage

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

Arguments

object	a mars object
newdata	an optional data frame in which to look for variables with which to predict (if omitted, the fitted values are used)
...	further arguments

Value

predicted values of the response variable

See Also

Other methods: plot.mars(), print.mars(), summary.mars()

Examples

```
mar <- mars(y~x1+x2+x3, data=mars::marstestdata, control=mars.control(Mmax=6))
predict(object=mar, newdata=mars::marstestdata)
```

---

print.mars *Prints out the function call and coefficients of a* mars *object*

Description

Prints out the function call and coefficients of a mars object

Usage

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

Arguments

x	a mars object
...	further arguments

See Also

Other methods: plot.mars(), predict.mars(), summary.mars()

Examples

```
mar <- mars(y~x1+x2+x3, data=mars::marstestdata, control=mars.control(Mmax=6))
print(mar)
```

---

summary.mars *Summary method for class "mars".*

Description

Prints function call, five-number summary, summary of hinge functions for each basis function, and the coefficients of each basis function of a mars object

Usage

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

Arguments

object	a mars object for which a summary is desired.
...	further arguments

See Also

Other methods: plot.mars(), predict.mars(), print.mars()

Examples

```
mar <- mars(y~x1+x2+x3, data=mars::marstestdata, control=mars.control(Mmax=6))
summary(mar)
```

Index