

Multivariate Adaptive Regression Splines (MARS)

Description

Fit Friedman's Multivariate Adaptive Regression Splines (MARS) model.

Usage

```
mars(formula, data, control) #for generating a mars object
```

Arguments

- formula**
an R formula specifying the dependent and independent variables in the model. The formula should take the form $y \sim x_1 + x_2 + \dots$, where y is the response variable and x_1, x_2 , etc. are the predictor variables.
- data**
a data frame containing the variables in the formula.
- control**
an object of class `mars.control` that specifies parameters used in the model fitting procedure. By default, the control object is constructed using `mars.control()`, with default values for the parameters.

Details

The function first extracts the response variable and the predictor variables from the data frame using the `model.frame()` function. Then, it performs forward stepwise regression on the data using the `fwd_stepwise()` function, followed by backward stepwise regression on the selected terms using the `bwd_stepwise()` function. The resulting basis functions and basis matrix are stored in the `bwd` object. Finally, a linear model is fit to the data using the `lm()` function, with the basis matrix and response variable as inputs. The resulting object is returned as a list with class 'mars'.

Value

an object of class 'mars' which will be used for plot, predict, etc.

Author(s)

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References

Friedman, J. H. (1991). Multivariate adaptive regression splines. *The Annals of Statistics*, 19(1), 1-67.

See Also

```
print.mars()
```

```
summary.mars()
```

```
predict.mars()
```

```
plot.mars()
```

```
anova.mars()
```

Examples

```
#example 1
# mars() with ISLR::Wage dataset
fit.mars <- mars(wage ~ age + education, data=ISLR::Wage, control = mars.control(Mmax=10))
# Show results
fit.mars
```

```
#example 2
# create your own dataset
n <- 1000
x1 <- rnorm(n)
x2 <- rnorm(n)
x3 <- rnorm(n)
y <- 2*x1 + 3*x2 + 4*x3 + rnorm(n)
df <- data.frame(x1=x1,x2=x2,x3=x3,y=y)
```

```
# fit a MARS model
fit <- mars(y ~ x1 + x2 + x3, data=df)
#show results
fit
```

```
#example 3
# another example using data(iris)
fit.iris <- mars(Sepal.Length ~., data=iris, control = mars.control(Mmax=10))
# Show results
fit.iris
```

Anova for MARS

Description

Anova for MARS

Usage

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

Arguments

`object` An object of class mars.

`...` Other arguments.

Value

The anova table of the fitted MARS model.

Examples

```
fit.mars <- mars(wage ~ age + education, data=ISLR::Wage, control = mars.control(Mmax=10))  
anova.mars(fit.mars)
```

Plot a MARS Model

Description

Plot a MARS Model

Usage

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

Arguments

^x
MARS model object (input mars object)

^{...}
further arguments passed to or from other methods

Value

2D plot for single variable basis function 3D plot for double variable basis function

Examples

```
fit.mars <- mars(wage ~ age + education, data=ISLR::Wage, control = mars.control(Mmax=10))  
plot.mars(fit.mars)
```

Prediction Function for MARS Model

Description

Prediction Function for MARS Model

Usage

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

Arguments

`object` MARS model object (input mars object)

`newdata` data frame or matrix with new data

`...` further arguments to be passed to or from methods.

Value

predicted values of fitted model

Examples

```
fit.mars <- mars(wage ~ age + education, data=ISLR::Wage, control = mars.control(Mmax=10))  
predict.mars(fit.mars)
```

Print method for MARS Model

Description

Print coefficients of the fitted mars model.

Usage

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

Arguments

`x`
MARS model object (input mars object)

`...` further arguments passed to or from other methods.

Examples

```
fit.mars <- mars(wage ~ age + education, data=ISLR::Wage, control = mars.control(Mmax=10))  
print.mars(fit.mars)
```

Summary Function for MARS Model

Description

Summary Function for MARS Model

Usage

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

Arguments

`object`
MARS model object (input mars object)

`...`
further arguments passed to or from other methods

Value

The function return the summary of the input MARS object as well as a generic summary function with the MARS object

Examples

```
fit.mars <- mars(wage ~ age + education, data=ISLR::Wage, control = mars.control(Mmax=10))  
summary.mars(fit.mars)
```