

Package: modelObj (via r-universe)

September 9, 2024

Type Package

Title A Model Object Framework for Regression Analysis

Version 4.2

Date 2022-06-05

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Description A utility library to facilitate the generalization of statistical methods built on a regression framework. Package developers can use 'modelObj' methods to initiate a regression analysis without concern for the details of the regression model and the method to be used to obtain parameter estimates. The specifics of the regression step are left to the user to define when calling the function. The user of a function developed within the 'modelObj' framework creates as input a 'modelObj' that contains the model and the R methods to be used to obtain parameter estimates and to obtain predictions. In this way, a user can easily go from linear to non-linear models within the same package.

Depends methods

Suggests stats, graphics

License GPL-2

Encoding UTF-8

NeedsCompilation no

RoxygenNote 7.1.1

Collate 'methodObj.R' 'methodObjPredict.R' 'methodObjSolver.R'
'methodObjSolverFormula.R' 'modelObj.R' 'modelObjFormula.R'
'methodObjSolverXY.R' 'modelObjXY.R' 'buildModelObj.R'
'modelObjFit.R' 'warnMsg.R'

Date/Publication 2022-06-07 08:30:09 UTC

Repository <https://sth1402.r-universe.dev>

RemoteUrl <https://github.com/cran/modelObj>

RemoteRef HEAD

RemoteSha 51d19b44de626ec114d6d9f0f019fb639ed60da7

Contents

| | |
|-----------------------------|-----------|
| buildModelObj | 2 |
| fit | 4 |
| fitObject | 5 |
| model | 6 |
| modelObj | 7 |
| modelObjFit-class | 8 |
| predict | 9 |
| predictor | 10 |
| predictorArgs | 11 |
| solver | 11 |
| solverArgs | 12 |
| Index | 14 |

| | |
|---------------|---|
| buildModelObj | <i>Create an Object of Class modelObj</i> |
|---------------|---|

Description

A utility function to transfer user defined models and estimation methods to an object of class modelObj.

Usage

```
buildModelObj(
  model,
  solver.method = NULL,
  solver.args = NULL,
  predict.method = NULL,
  predict.args = NULL
)
```

Arguments

| | |
|---------------|--|
| model | An object of class formula; the model. |
| solver.method | An object of class character specifying the name of the R function to be used to obtain parameter estimates. Or, the function to be used to obtain parameter estimates. For example, 'lm', 'glm', or 'rpart'. The specified modeling function MUST have a corresponding predict method. |

`solver.args` An object of class list containing additional arguments to be sent to `solver.method`. Arguments must be provided as a list, where the name of each element matches a formal argument of `solver.method`. For example, if a logistic regression using `glm` is desired,

$$\begin{aligned} \text{solver.method} &= \text{"glm"} \\ \text{solver.args} &= \text{list("family" = binomial)} \end{aligned}$$

A `solver.method` can take formal arguments `'formula'` and `'data'` as inputs, such as `lm` and `glm`. Some R methods do not use formal names `'formula'` and `'data'`; a user can indicate if a different naming convention is used for these two input arguments. For example, if a method expects the formula object to be passed through input variable `x`, `solver.args <- list("x"="formula")`

A `solver.method` can also take formal arguments `'x'` and `'y'` as inputs, such as `glmnet`. Some R methods do not use formal names `'x'` and `'y'` to indicate the covariate and response; a user can indicate if a different naming convention is used for these two input arguments. For example, if a method expects the covariate matrix to be passed through input variable `X`, `solver.args <- list("X"="x")`

`predict.method` A character. The name of the R function or the function to be used to obtain predictions. For example, `'predict.lm'`, `'predict'`, or `'predict.glm'`. If no function is explicitly given, the generic `predict` is assumed. For many methods, the generic method is appropriate.

`predict.args` A list. Additional arguments to be sent to `predict.method`. This must be provided as a list, where the name of each element matches a formal argument of `predict.method`. For example, if a logistic regression using `glm` was used to fit the model formula object and predictions on the scale of the response are desired,

$$\begin{aligned} \text{predict.method} &= \text{"predict.glm"} \\ \text{predict.args} &= \text{list("type" = "response")} \end{aligned}$$

It is assumed that the `predict.method` has formal arguments `"object"` and `"newdata"`. If `predict.method` does not use these formal arguments, `predict.args` must explicitly indicate the variable names used for these inputs. For example, `list("newx"="newdata")` if the new data is passed to `predict.method` through input argument `"newx"`.

Details

Unless changed by the user in `solver.args` and/or `predict.args`, default settings are assumed for the specified regression and prediction methods.

Value

An object of class `modelObjFormula` or `modelObjXY`, which inherit directly from `modelObj`.

Examples

```
#-----#
# Create modeling object using a formula
#-----#
```

```
mo <- buildModelObj(model=Y ~ X1 + X2 + X3 + X4,
  solver.method='lm',
  predict.method='predict.lm',
  predict.args=list(type='response'))
```

fit

Obtain parameter estimates

Description

Performs specified regression analysis.

Usage

```
fit(object, data, response, ...)
```

```
## S4 method for signature 'modelObj,data.frame'
```

```
fit(object, data, response, ...)
```

Arguments

| | |
|----------|--|
| object | An object of class <code>modelObj</code> as returned by the <code>buildModelObj</code> function. |
| data | An object of class <code>data.frame</code> containing the variables in the model. |
| response | An object of class <code>vector</code> containing the response variable. |
| ... | ignored |

Details

If defined by the modeling function, the following methods can be applied to the value object returned: `coef`, `plot`, `predict`, `print`, `residuals`, `show`, and `summary`.

Value

An object of class `modelObjFit`, which contains the object returned by the modeling function and the method to be used to obtain predictions.

Examples

```
# generate data
X <- matrix(rnorm(1000,0,1),
  ncol=4,
  dimnames=list(NULL,c("X1", "X2", "X3", "X4")))

Y <- X %*% c(0.1, 0.2, 0.3, 0.4) + rnorm(250)

X <- data.frame(X)

# create modeling object using a formula
```

```

mo <- buildModelObj(model=Y ~ X1 + X2 + X3 + X4,
                    solver.method='lm')

# fit model
fit.obj <- fit(object=mo, data=X, response=Y)

coef(fit.obj)
head(residuals(fit.obj))
plot(fit.obj)
head(predict(fit.obj,X))
summary(fit.obj)

```

fitObject

Retrieve Regression Object

Description

Retrieves the value object returned by the regression method used to obtain parameter estimates.

Usage

```

fitObject(object, ...)

## S4 method for signature 'ANY'
fitObject(object, ...)

## S4 method for signature 'modelObjFit'
fitObject(object, ...)

```

Arguments

| | |
|--------|---------------------------------|
| object | An object of class modelObjFit. |
| ... | ignored. |

Details

This function is useful for accessing methods that are defined by the regression method but are not directly accessible from the modelObjFit object. For example, for many regression methods, users can retrieve the fitted values by calling fitted.values(object). This method is not directly accessible from a modelObjFit. However, fitted.values() can be applied to the object returned by fitObject().

Value

The Value returned by the regression method specified in the governing modelObj. The exact structure of the value will depend on the regression method. For example, if nls() is the regression method, a list is returned.

Examples

```

# Generate data
X <- matrix(rnorm(1000,0,1),
            ncol=4,
            dimnames=list(NULL,c("X1","X2","X3","X4")))

Y <- X %*% c(0.1, 0.2, 0.3, 0.4) + rnorm(250)

X <- data.frame(X)

# Create modeling object using a formula
mo <- buildModelObj(model=Y ~ X1 + X2 + X3 + X4,
                    solver.method='lm')

# Fit model
fit.obj <- fit(object=mo, data=X, response=Y)

obj <- fitObject(fit.obj)
fobj <- fitted.values(obj)
head(fobj)

```

model

Retrieve model

Description

Retrieves model from modelObj

Usage

```

model(object, ...)

## S4 method for signature 'ANY'
model(object, ...)

## S4 method for signature 'modelObj'
model(object, ...)

## S4 method for signature 'modelObjFit'
model(object, ...)

```

Arguments

| | |
|--------|-------------------|
| object | A modelObj object |
| ... | ignored |

Value

The formula for the regression

| | |
|----------|-----------------------|
| modelObj | <i>Class</i> modelObj |
|----------|-----------------------|

Description

A class for model objects.

Details

Objects should not be created directly. The utility function `buildModelObj()` should be used.

Slots

`model` Object of class `formula`

`solver` Object of class `methodObjSolver` method to obtain parameter estimates.

`predictor` Object of class `methodObjPredict` method to obtain predicted values.

Methods

fit : Executes regression step.

model : Retrieve model.

solver : Retrieve regression method name.

solverArgs : Retrieve arguments to be sent to regression method.

solverArgs(object)<- : Set arguments to be sent to regression method.

predictor : Retrieve prediction method name.

predictorArgs : Retrieve arguments to be sent to prediction method.

predictorArgs(object)<- : Set arguments to be sent to prediction method.

Examples

```
showClass("modelObj")
```

modelObjFit-class *Class* modelObjFit

Description

A class for storing regression analysis results.

Usage

```
## S4 method for signature 'modelObjFit'  
coef(object, ...)  
  
## S4 method for signature 'modelObjFit'  
plot(x, y, ...)  
  
## S4 method for signature 'modelObjFit'  
print(x)  
  
## S4 method for signature 'modelObjFit'  
residuals(object, ...)  
  
## S4 method for signature 'modelObjFit'  
show(object)  
  
## S4 method for signature 'modelObjFit'  
summary(object, ...)
```

Arguments

| | |
|--------|--|
| object | An object of class modelObjFit |
| ... | passed to underlying method defined for regression value object. |
| x | An object of class modelObjFit |
| y | ignored |

Methods (by generic)

- coef: Extract Model Coefficients
- plot: X-Y plotting
- print: Print regression results
- residuals: Extract residuals
- show: Show regression results
- summary: Show summary results

Slots

`fitObj` Object returned by the regression analysis
`modelObj` Object of class `modelObj`.

Methods

fitObject : Extracts regression step.
model : Retrieve model.
solver : Retrieve regression method name.
solverArgs : Retrieve arguments to be sent to regression method.
solverArgs(object)<- : Set arguments to be sent to regression method.
predictor : Retrieve prediction method name.
predictorArgs : Retrieve arguments to be sent to prediction method.
predictorArgs(object)<- : Set arguments to be sent to prediction method.

Examples

```
showClass("modelObjFit")
```

| | |
|---------|--------------------------|
| predict | <i>Model Predictions</i> |
|---------|--------------------------|

Description

Predictions from the results of a fit object.

Usage

```
predict(object, ...)  
  
## S4 method for signature 'modelObjFit'  
predict(object, newdata, ...)
```

Arguments

| | |
|----------------------|---|
| <code>object</code> | An object of class <code>modelObjFit</code> as returned by the <code>fit()</code> function. |
| <code>newdata</code> | An object of class <code>data.frame</code> containing the variables in the model. |
| <code>...</code> | ignored |

Value

Model predictions, the form of which depend on the regression analysis.

Examples

```

# generate data
X <- matrix(rnorm(1000,0,1),
            ncol=4,
            dimnames=list(NULL,c("X1","X2","X3","X4")))

Y <- X %*% c(0.1, 0.2, 0.3, 0.4) + rnorm(250)

X <- data.frame(X)

# create modeling object using a formula
mo <- buildModelObj(model=Y ~ X1 + X2 + X3 + X4,
                    solver.method='lm')

# fit model
fit.obj <- fit(object=mo, data=X, response=Y)

predict(fit.obj)
predict(fit.obj, newdata = X[1:10,])

```

predictor

Retrieve Prediction Method

Description

Retrieves method for prediction analysis

Usage

```

predictor(object, ...)

## S4 method for signature 'modelObj'
predictor(object, ...)

## S4 method for signature 'modelObj'
predictor(object, ...)

## S4 method for signature 'modelObjFit'
predictor(object, ...)

```

Arguments

| | |
|--------|-------------------|
| object | A modelObj object |
| ... | ignored |

Value

An object of class character or function

| | |
|---------------|-------------------------------------|
| predictorArgs | <i>Retrieve Predictor Arguments</i> |
|---------------|-------------------------------------|

Description

Retrieves the arguments that are to be passed to the prediction method when called.

Usage

```

predictorArgs(object, ...)

## S4 method for signature 'modelObj'
predictorArgs(object, ...)

predictorArgs(object) <- value

## S4 replacement method for signature 'ANY,ANY'
predictorArgs(object) <- value

## S4 replacement method for signature 'modelObj,list'
predictorArgs(object) <- value

## S4 method for signature 'modelObjFit'
predictorArgs(object, ...)

```

Arguments

| | |
|--------|---------------------------|
| object | A modelObj object |
| ... | ignored |
| value | List to be stored in args |

Value

A list

| | |
|--------|-------------------------------|
| solver | <i>Retrieve Solver Method</i> |
|--------|-------------------------------|

Description

Retrieves method for regression analysis

Usage

```

solver(object, ...)

## S4 method for signature 'ANY'
solver(object, ...)

## S4 method for signature 'modelObj'
solver(object, ...)

## S4 method for signature 'modelObjFit'
solver(object, ...)

```

Arguments

| | |
|--------|-------------------|
| object | A modelObj object |
| ... | ignored |

Value

An object of class character or function

| | |
|------------|----------------------------------|
| solverArgs | <i>Retrieve Solver Arguments</i> |
|------------|----------------------------------|

Description

Retrieves the arguments that are to be passed to the regression method when called.

Usage

```

solverArgs(object, ...)

## S4 method for signature 'ANY'
solverArgs(object, ...)

## S4 method for signature 'modelObj'
solverArgs(object, ...)

solverArgs(object) <- value

## S4 replacement method for signature 'ANY,ANY'
solverArgs(object) <- value

## S4 replacement method for signature 'modelObj,list'
solverArgs(object) <- value

## S4 method for signature 'modelObjFit'
solverArgs(object, ...)

```

solverArgs

13

Arguments

| | |
|--------|---------------------------|
| object | A modelObj object |
| ... | ignored |
| value | List to be stored in args |

Value

A list

Index

buildModelObj, 2

coef, modelObjFit-method
(modelObjFit-class), 8

fit, 4
fit, modelObj, data.frame-method (fit), 4
fitObject, 5
fitObject, ANY-method (fitObject), 5
fitObject, modelObjFit-method
(fitObject), 5

model, 6
model, ANY-method (model), 6
model, modelObj-method (model), 6
model, modelObjFit-method (model), 6
modelObj, 3, 7
modelObjFit-class, 8
modelObjFormula-class (modelObj), 7
modelObjXY-class (modelObj), 7

plot, modelObjFit-method
(modelObjFit-class), 8

predict, 9
predict, modelObjFit-method (predict), 9
predictor, 10
predictor, modelObj-method (predictor),
10
predictor, modelObjFit-method
(predictor), 10
predictorArgs, 11
predictorArgs, modelObj-method
(predictorArgs), 11
predictorArgs, modelObjFit-method
(predictorArgs), 11
predictorArgs<- (predictorArgs), 11
predictorArgs<-, ANY, ANY-method
(predictorArgs), 11
predictorArgs<-, modelObj, list-method
(predictorArgs), 11

print, modelObjFit-method
(modelObjFit-class), 8

residuals, modelObjFit-method
(modelObjFit-class), 8

show, modelObjFit-method
(modelObjFit-class), 8

solver, 11
solver, ANY-method (solver), 11
solver, modelObj-method (solver), 11
solver, modelObjFit-method (solver), 11
solverArgs, 12
solverArgs, ANY-method (solverArgs), 12
solverArgs, modelObj-method
(solverArgs), 12
solverArgs, modelObjFit-method
(solverArgs), 12
solverArgs<- (solverArgs), 12
solverArgs<-, ANY, ANY-method
(solverArgs), 12
solverArgs<-, modelObj, list-method
(solverArgs), 12

summary, modelObjFit-method
(modelObjFit-class), 8