Package ‘modeltools’

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Description  A collection of tools to deal with statistical models.
             The functionality is experimental and the user interface is likely to
             change in the future. The documentation is rather terse, but packages `coin`
             and `party` have some working examples. However, if you find the
             implemented ideas interesting we would be very interested in a discussion
             of this proposal. Contributions are more than welcome!
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Formulaparts-class

Class "FormulaParts"

Description

A class describing the parts of a formula.

Objects from the Class

Objects can be created by calls of the form new("FormulaParts", ...).

Slots

formula: Object of class "list".

Methods

No methods defined with class "FormulaParts" in the signature.

Generics

Generic Utility Functions

Description

A collection of standard generic functions for which other packages provide methods.

Usage

ICL(object, ...)
KLDiv(object, ...)
Lapply(object, FUN, ...)
clusters(object, newdata, ...)
getModel(object, ...)
parameters(object, ...)
posterior(object, newdata, ...)
prior(object, ...)
refit(object, newdata, ...)
relabel(object, by, ...)
ParseFormula(formula, data = list())
info

Arguments

  object  S4 classed object.
  formula A model formula.
  data    An optional data frame.
  FUN     The function to be applied.
  newdata Optional new data.
  by      Typically a character string specifying how to relabel the object.
  ...    Some methods for these generic function may take additional, optional arguments.

Details

  KLdiv: Kullback-Leibler divergence.
  Lapply: S4 generic for lapply
  clusters: Get cluster membership information from a model or compute it for new data.
  getModel: Get single model from a collection of models.
  parameters: Get parameters of a model (similar to but more general than coefficients).
  posterior: Get posterior probabilities from a model or compute posteriors for new data.
  prior: Get prior probabilities from a model.
  refit: Refit a model (usually to obtain additional information that was not computed or stored during
         the initial fitting process).
  relabel: Relabel a model (usually to obtain a new permutation of labels in mixture models or cluster
            objects).

Author(s)

  Friedrich Leisch

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Get Information on Fitted Objects

Description

Returns descriptive information about fitted objects.

Usage

  info(object, which, ...)
  ## S4 method for signature 'ANY,missing'
  info(object, which, ...)
  infoCheck(object, which, ...)

Arguments

object fitted object.
which which information to get. Use which="help" to list available information.
... passed to methods.

Details

Function info can be used to access slots of fitted objects in a portable way.
Function infoCheck returns a logical value that is TRUE if the requested information can be computed from the object.

Author(s)

Friedrich Leisch

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**MEapply**  
Apply functions to Data in Object of Class "ModelEnv"

---

Description

Apply a single function or a collection of functions to the data objects stored in a model environment.

Usage

```r
## S4 method for signature 'ModelEnv'
MEapply(object, FUN, clone = TRUE, ...)
```

Arguments

- object Object of class "ModelEnv".
- FUN Function or list of functions.
- clone If TRUE, return a clone of the original object, if FALSE, modify the object itself.
- ... Passed on to FUN.

Examples

```r
data(iris)
me <- ModelEnvFormula(Species~Petal.Width-1, data=iris,
  subset=sample(1:150, 10))

me1 <- MEapply(me, FUN=list(designMatrix=scale,
  response=function(x) sapply(x, as.numeric)))

me@get("designMatrix")
me1@get("designMatrix")
```
**ModelEnv-class**

**Class "ModelEnv"**

**Description**

A class for model environments.

**Details**

Objects of class `ModelEnv` basically consist of an `environment` for data storage as well as `get` and `set` methods.

- `na.fail` returns FALSE when at least one missing value occurs in `object@env`. `na.pass` returns `object` unchanged and `na.omit` returns a copy of `object` with all missing values removed.

**Objects from the Class**

Objects can be created by calls of the form `new("ModelEnv", ...)`.

**Slots**

- `env`: Object of class "environment".
- `get`: Object of class "function" for extracting objects from environment `env`.
- `set`: Object of class "function" for setting object in environment `env`.
- `hooks`: A list of hook collections.

**Methods**

- `clone` signature(object = "ModelEnv"): copy an object.
- `dimension` signature(object = "ModelEnv", which = "character"): get the dimension of an object.
- `empty` signature(object = "ModelEnv"): Return TRUE, if the model environment contains no data.
- `has` signature(object = "ModelEnv", which = "character"): check if an object which is available in `env`.
- `initialize` signature(.Object = "ModelEnv"): setup new objects.
- `show` signature(object = "ModelEnv"): show object.
- `subset` signature(x = "ModelEnv"): extract subsets from an object.
- `na.pass` `na.action` method for `ModelEnv` objects.
- `na.fail` `na.action` method for `ModelEnv` objects.
- `na.omit` `na.action` method for `ModelEnv` objects.
Examples

```r
### a new object
me <- new("ModelEnv")

### the new model environment is empty
empty(me)

### define a bivariate response variable
me@set("response", data.frame(y = rnorm(10), x = runif(10)))
me

### now it is no longer empty
empty(me)

### check if a response is available
has(me, "response")

### the dimensions
dimension(me, "response")

### extract the data
me@get("response")

df <- data.frame(x = rnorm(10), y = rnorm(10))

### hook for set method:
mf <- ModelEnvFormula(y ~ x-1, data = df, setHook=list(designMatrix=scale))
mf@get("designMatrix")
mf@set(data=df[1:5,])
mf@get("designMatrix")

### NA handling
df$x[1] <- NA
mf <- ModelEnvFormula(y ~ x, data = df, na.action = na.pass)
mf
na.omit(mf)
```

ModelEnvFormula Generate a model environment from a classical formula based interface.

Description

A flexible implementation of the classical formula based interface.

Usage

ModelEnvFormula(formula, data = list(), subset = NULL,
Arguments

- **formula**: a symbolic description of the model to be fit.
- **data**: an optional data frame containing the variables in the model. If not found in data, the variables are taken from frame, by default the environment from which ModelEnvFormula is called.
- **subset**: an optional vector specifying a subset of observations to be used in the fitting process.
- **na.action**: a function which indicates what should happen when the data contain NA’s.
- **frame**: an optional environment formula is evaluated in.
- **enclos**: specifies the enclosure passed to `eval` for evaluating the model frame. The model frame is evaluated in `envir = frame` with `enclos = enclos`, see `eval`.
- **other**: an optional named list of additional formulae.
- **designMatrix**: a logical indicating whether the design matrix defined by the right hand side of formula should be computed.
- **responseMatrix**: a logical indicating whether the design matrix defined by the left hand side of formula should be computed.
- **setHook**: a list of functions to `MEapply` every time set is called on the object.
- **...**: additional arguments for be passed to function, for example `contrast.arg` to `model.matrix`.

Details

This function is an attempt to provide a flexible infrastructure for the implementation of classical formula based interfaces. The arguments formula, data, subset and na.action are well known and are defined in the same way as in `lm`, for example.

ModelEnvFormula returns an object of class `ModelEnvFormula-class` - a high level object for storing data improving upon the capabilities of data.frames.

Value

An object of class `ModelEnvFormula-class`.

Examples

```r
### the 'usual' interface
data(iris)
mf <- ModelEnvFormula(Species ~ ., data = iris)
mf
```
### ModelEnvFormula-class

#### Description

A class for formula-based model environments.

#### Objects from the Class

Objects can be created by calls of the form `new("ModelEnvFormula", ...)`.  

#### Slots

- **env**: Object of class "environment".
- **get**: Object of class "function" for extracting objects from environment `env`.
- **set**: Object of class "function" for setting object in environment `env`.
- **formula**: Object of class "list".
- **hooks**: A list of hook collections.

#### Extends

Class "ModelEnv", directly. Class "FormulaParts", directly.

#### Methods

No methods defined with class "ModelEnvFormula" in the signature.
ModelEnvMatrix

Generate a model environment from design and response matrix

Description

A simple model environment creator function working off matrices for input and response. This is much simpler and more limited than formula-based environments, but faster and easier to use, if only matrices are allowed as input.

Usage

ModelEnvMatrix(designMatrix=NULL, responseMatrix=NULL, 
    subset = NULL, na.action = NULL, other=list(), ...)

Arguments

- designMatrix: design matrix of input
- responseMatrix: matrix of responses
- subset: an optional vector specifying a subset of observations to be used in the fitting process.
- na.action: a function which indicates what should happen when the data contain NA's.
- other: an optional named list of additional formulae.
- ...: currently not used

Details

ModelEnvMatrix returns an object of class ModelEnv-class - a high level object for storing data improving upon the capabilities of simple data matrices.

Funny things may happen if the input and response matrices do not have distinct column names and the data new data are supplied via the get and set slots.

Value

An object of class ModelEnv-class.

Examples

```r
## use Sepal measurements as input and Petal as response
data(iris)
me <- ModelEnvMatrix(iris[,1:2], iris[,3:4])
me

## extract data from the ModelEnv object
dim(me@get("designMatrix"))
summary(me@get("responseMatrix"))
```
### subsets and missing values
iris[,1] <- NA
me <- ModelEnvMatrix(iris[,1:2], iris[,3:4], subset=1:5, na.action=na.omit)

## First case is not complete, so me contains only cases 2:5
me
me@get("designMatrix")
me@get("responseMatrix")

## use different cases
me@set(data=iris[10:20,])
me@get("designMatrix")

## these two should be the same
stopifnot(all.equal(me@get("responseMatrix"), as.matrix(iris[10:20,3:4])))

---

### Model Predictions

#### Description
A function for predictions from the results of various model fitting functions.

#### Usage
```
Predict(object, ...)  
```

#### Arguments
- `object` a model object for which prediction is desired.
- `...` additional arguments affecting the predictions produced.

#### Details
A somewhat improved version of `predict` for models fitted with objects of class `StatModel-class`.

#### Value
Should return a vector of the same type as the response variable specified for fitting object.

#### Examples
```
df <- data.frame(x = runif(10), y = rnorm(10))
mf <- dpp(linearModel, y ~ x, data = df)
Predict(fit(linearModel, mf))
```
Description

A class for unfitted statistical models.

Objects from the Class

Objects can be created by calls of the form new("StatModel", ...).

Slots

name: Object of class "character", the name of the model.
dpp: Object of class "function", a function for data preprocessing (usually formula-based).
fit: Object of class "function", a function for fitting the model to data.
predict: Object of class "function", a function for computing predictions.
capabilities: Object of class "StatModelCapabilities".

Methods

fit signature(model = "StatModel", data = "ModelEnv"): fit model to data.

Details

This is an attempt to provide unified infrastructure for unfitted statistical models. Basically, an unfitted model provides a function for data preprocessing (dpp, think of generating design matrices), a function for fitting the specified model to data (fit), and a function for computing predictions (predict).

Examples for such unfitted models are provided by linearModel and glinearModel which provide interfaces in the "StatModel" framework to lm.fit and glm.fit, respectively. The functions return objects of S3 class "linearModel" (inheriting from "lm") and "glinearModel" (inheriting from "glm"), respectively. Some methods for S3 generics such as predict, fitted, print and model.matrix are provided to make use of the "StatModel" structure. (Similarly, survReg provides an experimental interface to survreg.)

Examples

```r
### linear model example
df <- data.frame(x = runif(10), y = rnorm(10))
mf <- dpp(linearModel, y ~ x, data = df)
mylm <- fit(linearModel, mf)

### equivalent
print(mylm)
lm(y ~ x, data = df)
```
StatModelCapabilities-class

Description

A class describing capabilities of a statistical model.

Objects from the Class

Objects can be created by calls of the form new("StatModelCapabilities", ...).

Slots

weights: Object of class "logical"
subset: Object of class "logical"

Methods

No methods defined with class "StatModelCapabilities" in the signature.

### predictions
 Predict(ylm, newdata = data.frame(x = runif(10)))
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