Package 'logitFD'

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Type Package

Title Functional Principal Components Logistic Regression

Version 1.0

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Author

Carmen Lucia Reina <carmenlureina@gmail.com> Ana Maria Aguilera <aaguiler@ugr.es>
and Manuel Escabias <escabias@ugr.es>

Description Functions for fitting a functional principal components logit regression model
in four different situations: ordinary and filtered functional principal components
of functional predictors, included in the model according to their variability
explanation power, and according to their prediction ability by stepwise methods. The
proposed methods were developed in Escabias et al (2004)
<doi:10.1080/10485250310001624738> and Escabias et al (2005)
<doi:10.1016/j.csda.2005.03.011>.

Depends R (>= 3.4.3)

License GPL (>= 2)

Imports fda, expm, pROC, fda.usc

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Maintainer Manuel Escabias <escabias@ugr.es>

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R topics documented:

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logitFD.fpc   *Filtered Functional Principal Component Logistic Regression by explained variability order*

Description

Fit of the Filtered Functional Principal Component Logistic Regression model with selected Functional Principal Components included in the model according their explained variability.

Usage

```
logitFD.fpc(Response, FDobj = list(), ncomp = c(), nonFDvars = NULL)
```

Arguments

Response	Binary (numeric or character) vector of observations of the response variable.
FDobj	List of functional objects from fda package with the curves of the predictor functional variables.
ncomp	Numeric vector with the number of components to be considered for each functional predictor. The vector has equal lenght than FDobj.
nonFDvars	Matrix or data frame with the observations of non-functional variables.

Value

glm.fit	glm object of the fitted model. The object allows to use the summary() function for printing a summary of the fit, the anova() function to produce an analysis of variance table, and to extract useful features as coefficients, effects, fitted.values or residuals
Intercept	Intercept estimated parameter
betalist	List of functional objects (fdobj) of fda package with the estimated parameter functions. Each element of the list corresponds to the associated functional predictor located in the same position of FDobj. All methods of fd package can be used as the plot() function among others.
PC.variance	List of data frames with explained variability of functional principal components of functional predictors. Each element of the list contains the acumulation variance matrix corresponding to the associated functional variable in the same position.
ROC.curve	Object of the roc() function of the pROC package for prediction ability testing of the model. The object can be printed, plotted, or passed to many other functions

Author(s)

Carmen Lucia Reina <carmenlureina@gmail.com> and Manuel Escabias <escabias@ugr.es>

Examples

```
library(fda.usc)
data(aemet)
Temp<-aemet$temp$data
Prec<-exp(aemet$logprec$data)
StationsVars<-aemet$df[,c("ind","altitude","longitude","latitude")]
StationsVars$North<-c(1,1,1,1,0,0,0,0,1,1,0,0,0,0,0,1,1,1,0,0,1,0,0,0,0,1,0,0,1,1,1,1,1,
0,0,0,1,1,1,1,1,1,1,1,1,0,0,0,0,1,1,1,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,1,1,1,1)
TempMonth<-matrix(0,73,12)
PrecMonth<-matrix(0,73,12)
for (i in 1:nrow(TempMonth)){
  TempMonth[i,1]<-mean(Temp[i,1:31])
  PrecMonth[i,1]<-mean(Prec[i,1:31])
  TempMonth[i,2]<-mean(Temp[i,32:59])
  PrecMonth[i,2]<-mean(Prec[i,32:59])
  TempMonth[i,3]<-mean(Temp[i,60:90])
  PrecMonth[i,3]<-mean(Prec[i,60:90])
  TempMonth[i,4]<-mean(Temp[i,91:120])
  PrecMonth[i,4]<-mean(Prec[i,91:120])
  TempMonth[i,5]<-mean(Temp[i,121:151])
  PrecMonth[i,5]<-mean(Prec[i,121:151])
  TempMonth[i,6]<-mean(Temp[i,152:181])
  PrecMonth[i,6]<-mean(Prec[i,152:181])
  TempMonth[i,7]<-mean(Temp[i,182:212])
  PrecMonth[i,7]<-mean(Prec[i,182:212])
  TempMonth[i,8]<-mean(Temp[i,213:243])
  PrecMonth[i,8]<-mean(Prec[i,213:243])
  TempMonth[i,9]<-mean(Temp[i,244:273])
  PrecMonth[i,9]<-mean(Prec[i,244:273])
  TempMonth[i,10]<-mean(Temp[i,274:304])
  PrecMonth[i,10]<-mean(Prec[i,274:304])
  TempMonth[i,11]<-mean(Temp[i,305:334])
  PrecMonth[i,11]<-mean(Prec[i,305:334])
  TempMonth[i,12]<-mean(Temp[i,335:365])
  PrecMonth[i,12]<-mean(Prec[i,335:365])
  }
FourierBasis<-create.fourier.basis(rangeval = c(1,12),nbasis=7)
BsplineBasis<-create.bspline.basis(rangeval = c(1,12),nbasis=8)
TempMonth.fd<-Data2fd(argvals = c(1:12), y=t(TempMonth),basisobj = FourierBasis)
PrecMonth.fd<-Data2fd(argvals = c(1:12), y=t(PrecMonth),basisobj = BsplineBasis)
logitFD.fpc(Response=StationsVars$North,FDobj=list(TempMonth.fd,PrecMonth.fd),
 ncomp = c(3,4),nonFDvars = StationsVars[,c("altitude","longitude")])
```

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logitFD.fpc.step	*Filtered Functional Principal Component Logistic Regression by step-wise order*

Description

Fit of the Filtered Functional Principal Component Logistic Regression model with Functional Principal Components and nonfunctional variables included in the model according their prediction

ability by an authomatic stepwise selection method.

Usage

```
logitFD.fpc.step(Response, FDobj = list(), nonFDvars = NULL)
```

Arguments

Response	Binary (numeric or character) vector of observations of the response variable.
FDobj	List of functional objects from fda package with the curves of the predictor functional variables.
nonFDvars	Matrix or data frame with the observations of non-functional variables.

Value

glm.fit	glm object of the fitted model. The object allows to use the summary() function for printing a summary of the fit, the anova() function to produce an analysis of variance table, and to extract useful features as coefficients, effects, fitted.values or residuals
Intercept	Intercept estimated parameter
betalist	List of functional objects (fdobj) of fda package with the estimated parameter functions. Each element of the list corresponds to the associated functional predictor located in the same position of FDobj. All methods of fd package can be used as the plot() function among others.
PC.variance	List of data frames with explained variability of functional principal components of functional predictors. Each element of the list contains the acumulation variance matrix corresponding to the associated functional variable in the same position.
ROC.curve	Object of the roc() function of the pROC package for prediction ability testing of the model. The object can be printed, plotted, or passed to many other functions

Author(s)

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Examples

```
library(fda.usc)
data(aemet)
Temp<-aemet$temp$data
Prec<-exp(aemet$logprec$data)
StationsVars<-aemet$df[,c("ind","altitude","longitude","latitude")]
StationsVars$North<-c(1,1,1,1,0,0,0,0,1,1,0,0,0,0,0,1,1,1,0,0,1,0,0,0,0,1,0,0,1,1,1,1,1,
0,0,0,1,1,1,1,1,1,1,1,1,0,0,0,0,1,1,1,1,1,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,1,1,1,1)
TempMonth<-matrix(0,73,12)
PrecMonth<-matrix(0,73,12)
for (i in 1:nrow(TempMonth)){
  TempMonth[i,1]<-mean(Temp[i,1:31])
  PrecMonth[i,1]<-mean(Prec[i,1:31])
```

```
     TempMonth[i,2]<-mean(Temp[i,32:59])
     PrecMonth[i,2]<-mean(Prec[i,32:59])
     TempMonth[i,3]<-mean(Temp[i,60:90])
     PrecMonth[i,3]<-mean(Prec[i,60:90])
     TempMonth[i,4]<-mean(Temp[i,91:120])
     PrecMonth[i,4]<-mean(Prec[i,91:120])
     TempMonth[i,5]<-mean(Temp[i,121:151])
     PrecMonth[i,5]<-mean(Prec[i,121:151])
     TempMonth[i,6]<-mean(Temp[i,152:181])
     PrecMonth[i,6]<-mean(Prec[i,152:181])
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     TempMonth[i,10]<-mean(Temp[i,274:304])
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     TempMonth[i,11]<-mean(Temp[i,305:334])
     PrecMonth[i,11]<-mean(Prec[i,305:334])
     TempMonth[i,12]<-mean(Temp[i,335:365])
     PrecMonth[i,12]<-mean(Prec[i,335:365])
     }
 FourierBasis<-create.fourier.basis(rangeval = c(1,12),nbasis=7)
 BsplineBasis<-create.bspline.basis(rangeval = c(1,12),nbasis=8)
 TempMonth.fd<-Data2fd(argvals = c(1:12), y=t(TempMonth),basisobj = FourierBasis)
 PrecMonth.fd<-Data2fd(argvals = c(1:12), y=t(PrecMonth),basisobj = BsplineBasis)
 logitFD.fpc.step(Response=StationsVars$North,FDobj=list(TempMonth.fd,PrecMonth.fd),
  nonFDvars = StationsVars[,c("altitude","longitude")])
```

---

logitFD.pc	*Functional Principal Component Logistic Regression by explained variability order*

Description

Fit of the Functional Principal Component Logistic Regression model with selected Functional Principal Components included in the model according their explained variability.

Usage

```
logitFD.pc(Response, FDobj = list(), ncomp = c(), nonFDvars = NULL)
```

Arguments

Response	Binary (numeric or character) vector of observations of the response variable.
FDobj	List of functional objects from fda package with the curves of the predictor functional variables.

ncomp   Numeric vector with the number of components to be considered for each func-
                 tional predictor. The vector has equal lenght than FDobj.

nonFDvars   Matrix or data frame with the observations of non-functional variables.

Value

glm.fit   glm object of the fitted model. The object allows to use the summary() function
                 for printing a summary of the fit, the anova() function to produce an analysis of
                 variance table, and to extract useful features as coefficients, effects, fitted.values
                 or residuals

Intercept   Intercept estimated parameter

betalist   List of functional objects (fdobj) of fda package with the estimated parameter
                 functions. Each element of the list corresponds to the associated functional pre-
                 dictor located in the same position of FDobj. All methods of fd package can be
                 used as the plot() function among others.

PC.variance   List of data frames with explained variability of functional principal compo-
                 nents of functional predictors. Each element of the list contains the acumulation
                 variance matrix corresponding to the associated functional variable in the same
                 position.

ROC.curve   Object of the roc() function of the pROC package for prediction ability testing of
                 the model. The object can be printed, plotted, or passed to many other functions

Author(s)

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Examples

```
library(fda.usc)
data(aemet)
Temp<-aemet$temp$data
Prec<-exp(aemet$logprec$data)
StationsVars<-aemet$df[,c("ind","altitude","longitude","latitude")]
StationsVars$North<-c(1,1,1,1,0,0,0,0,1,1,0,0,0,0,0,1,1,1,0,0,1,0,0,0,0,1,0,0,1,1,1,1,1,
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TempMonth<-matrix(0,73,12)
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for (i in 1:nrow(TempMonth)){
  TempMonth[i,1]<-mean(Temp[i,1:31])
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  PrecMonth[i,3]<-mean(Prec[i,60:90])
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  PrecMonth[i,10]<-mean(Prec[i,274:304])
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  PrecMonth[i,11]<-mean(Prec[i,305:334])
  TempMonth[i,12]<-mean(Temp[i,335:365])
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```
    PrecMonth[i,12]<-mean(Prec[i,335:365])
    }
FourierBasis<-create.fourier.basis(rangeval = c(1,12),nbasis=7)
BsplineBasis<-create.bspline.basis(rangeval = c(1,12),nbasis=8)
TempMonth.fd<-Data2fd(argvals = c(1:12), y=t(TempMonth),basisobj = FourierBasis)
PrecMonth.fd<-Data2fd(argvals = c(1:12), y=t(PrecMonth),basisobj = BsplineBasis)
logitFD.pc.step(Response=StationsVars$North,FDobj=list(TempMonth.fd,PrecMonth.fd),
 nonFDvars = StationsVars[,c("altitude","longitude")])
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