

# Package ‘funpca’

June 15, 2023

**Type** Package

**Title** Functional Principal Component Analysis

**Version** 9.0

**Date** 2023-06-08

**Depends** Brobdingnag, MASS, nlme, fda

**Description** Functional principal component analysis under the Linear Mixed Models representation of smoothing splines. The method utilizes the Demmler-Reinsch basis and assumes error independence. For more details see: F. Rosales (2016) <<https://ediss.uni-goettingen.de/handle/11858/00-1735-0000-0028-87F9-6>>.

**License** GPL-2

**NeedsCompilation** no

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**Repository** CRAN

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## R topics documented:

funpca-package . . . . .	2
funpca . . . . .	3
plot.funpca . . . . .	4
summary.funpca . . . . .	5

<b>Index</b>	<b>7</b>
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funpca-package

*Functional Principal Component Analysis*

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## Description

Performs functional principal component analysis using the mixed models representation of smoothing splines.

## Details

Package: fpcamm  
Version: 1.0  
Date: 2023-06-08  
Depends: Brobdingnag, MASS, nlme

### Index:

funpca	Performs FPCA using the MM representation of penalized splines.
plot.funpca	Plots fitted curves: overall trend, subj spec deviations and derivative of the mean curve.
summary.funpca	Summary of individual fits.

The function `funpca()` is used to fit the model. Using the resulting `funpca` object, fitted curves or their derivatives can be plotted with [plot](#) and summary information on the fit can be printed using [summary](#).

## Author(s)

Francisco Rosales Maintainer: Francisco Rosales <[francisco.rosales-marticoarena@protonmail.com](mailto:francisco.rosales-marticoarena@protonmail.com)>

## References

Rosales, F.  
For more details see <<https://ediss.uni-goettingen.de/handle/11858/00-1735-0000-0028-87F9-6>>

## See Also

[fda](#) (package fda)

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funpca *Functional Principal Component Analysis*

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### Description

Performs functional principal component analysis using the mixed models representation of smoothing splines.

### Usage

```
funpca(mat, k)
```

### Arguments

mat	Is a rectangular matrix with no missing values. Each column represents a sample.
k	Desired number of eigen functions to construct subj spec deviations. Should be between 1 and the sample size.

### Details

The method assumes DATA is a complete rectangular matrix and hence does not support missing values.

### Value

A list object of class funpca containing the following information.

est	Mixed model estimation
f	A matrix with the fitted overall trend. All columns contain the same information
di	A matrix with the fitted subj spec deviations
fi	Fitted values for each subject, i.e. fitted overall trend + fitted subj spec deviations + subj spec seasonality.
error	Remainder component for each subject.
residuals	Remainder component for each subject.
y	Data used for all the computations.
call	Call of funpca.

### Author(s)

Francisco Rosales <[francisco.rosales-marticorena@protonmail.com](mailto:francisco.rosales-marticorena@protonmail.com)>

### References

Rosales, F.  
For more details see <<https://ediss.uni-goettingen.de/handle/11858/00-1735-0000-0028-87F9-6>>

**See Also**

[fda](#) (package fda)

**Examples**

```
library(fda)
sdata <- NULL
data <- CanadianWeather$monthlyTemp
for(i in 1:ncol(data)) sdata <- cbind(sdata,spline(data[,i])$y)
x <- funpca(sdata, k=3)
```

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plot.funpca

*Plot fitted components*

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**Description**

Plots fitted signals and shows acf/pacf for the each one. Additionally a plot for all curves is added at the beginning.

**Usage**

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

**Arguments**

x                    funpca object.  
...                   Other arguments to be called by plot().

**Details**

Plot of the fitted results.

**Value**

The function returns the selected plots.

**Author(s)**

Francisco Rosales

**References**

Rosales, F.  
For more details see <<https://ediss.uni-goettingen.de/handle/11858/00-1735-0000-0028-87F9-6>>

**See Also**

[plot.funpca](#) (package funpca)

**Examples**

```
library(fda)
sdata <- NULL
data <- CanadianWeather$monthlyTemp
for(i in 1:ncol(data)) sdata <- cbind(sdata,spline(data[,i])$y)
x <- funpca(sdata, k=3)
plot(x)
```

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summary.funpca

*funpca Summary*

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**Description**

Takes an funpca object produced by funpca and summarizes the information of the components fi (individual fits).

**Usage**

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

**Arguments**

object            funpca object.  
...                further arguments to be passed to summary().

**Value**

The function gives basic statistics of the components resulting from applying funpca.

**Author(s)**

Francisco Rosales <francisco.rosales-marticorena@protonmail.com>

**References**

Rosales, F. and Krivobokova, T.  
For more details see <<https://ediss.uni-goettingen.de/handle/11858/00-1735-0000-0028-87F9-6>>

**See Also**

[plot.funpca](#) (package funpca),

**Examples**

```
library(fda)
sdata <- NULL
data <- CanadianWeather$monthlyTemp
for(i in 1:ncol(data)) sdata <- cbind(sdata,spline(data[,i])$y)
x <- funpca(sdata, k=3)
summary(x)
```

# Index

- \* **fda**
    - summary.funpca, [5](#)
  - \* **funpca**
    - funpca, [3](#)
  - \* **nonlinear**
    - funpca, [3](#)
  - \* **package**
    - funpca-package, [2](#)
  - \* **plot**
    - plot.funpca, [4](#)
  - \* **splines**
    - funpca, [3](#)
  - \* **summary**
    - summary.funpca, [5](#)
- fda, [2](#), [4](#)  
funpca, [3](#)  
funpca-package, [2](#)
- plot, [2](#)  
plot.funpca, [4](#), [5](#)
- summary, [2](#)  
summary.funpca, [5](#)