Package ‘kfda’

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Type Package

Title Kernel Fisher Discriminant Analysis

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Description Kernel Fisher Discriminant Analysis (KFDA) is performed using Kernel Principal Component Analysis (KPCA) and Fisher Discriminant Analysis (FDA). There are some similar packages. First, 'lfda' is a package that performs Local Fisher Discriminant Analysis (LFDA) and performs other functions. In particular, 'lfda' seems to be impossible to test because it needs the label information of the data in the function argument. Also, the 'ks' package has a limited dimension, which makes it difficult to analyze properly.


License GPL-3

Encoding UTF-8

LazyData yes

Repository CRAN

URL https://github.com/ainsuotain/kfda

Depends R (>= 3.0.0), kernlab, MASS

NeedsCompilation no

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Kernel Fisher Discriminant Analysis (KFDA)

Description
Train the trainData using KFDA. Basically, we run KFDA using Gaussian kernel. Returns trained KFDA object.

Usage
kfda(trainData = data, kernel.name = "rbfdot", kpar.sigma = 0.001, threshold = 1e-05)

Arguments
- **trainData**: an optional data frame or matrix containing the variables in the model. In particular, the last column of the data frame should contain the target value.
- **kernel.name**: the kernel function used in training and predicting. This parameter is fixed in the `rbfdot` (Gaussian kernel).
- **kpar.sigma**: hyper-parameter of selected kernel. `sigma` inverse kernel width for the Gaussian kernel function "rbfdot".
- **threshold**: the value of the eigenvalue under which principal components are ignored (only valid when features = 0). (default : 1e-05).

Details
Train the trainData using KFDA. Basically, we run KFDA using Gaussian kernel. Returns trained KFDA object. Since this function performs KFDA with the appropriate combination of `kpca` and `lda`, the following values can show the result of each function.

Value
An object of class `kfda`.
- **kpca.train**: An object of class "kpca". It has results of kpca function. (see `kpca` (in package `kernlab`))
- **lda.rotation.train**: The result of applying LDA, After KPCA is performed on trainData.
- **LDs**: A dataframe of linear discriminants of LDA.
- **label**: A vector of class label of trainData.

Note
This package is an early version and will be updated in the future.
kfda.predict

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References


See Also

kpca (in package kernlab) lda (in package MASS) kfda.predict

Examples

# data input
data(iris)

# data separation
idx <- sample(1:dim(iris)[1], round(dim(iris)[1]*0.7))
trainData <- iris[idx, ]

# training KFDA model
kfda.model <- kfda(trainData = trainData, kernel.name = "rbfdot")

# structure of kfda.model
str(kfda.model)

kfda.predict

Predict Method for Kernel Fisher Discriminant Analysis (KFDA) fit

Description

Test the testData using KFDA. This function is used after training phase is performed using the kfda function.

Usage

kfda.predict(object = obj, testData = data)

Arguments

object An R object of class kfda.
testData an optional data frame or matrix containing the variables in the model. In particular, the order of variables in the data frame must be the same as trainData, and the target value must be removed in advance.
Details

Since this function inherits KPCA and LDA, various learning can be possible by adjusting the hyperparameters of each function.

Value

The result of performing testData on the KFDA model.

- **class**: A class label of testData.
- **posterior**: A posterior probabilities for the classes.
- **x**: The scores of testData on up to kfd discriminant variables.

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References


See Also

- **kfda**

Examples

```r
# data input
data(iris)

# data separation
dim(iris)
idx <- sample(1:dim(iris)[1], round(dim(iris)[1]*0.7))
trainData <- iris[idx,]
testData <- iris[-(idx), -dim(iris)[2]]
testData.label <- iris[-(idx), dim(iris)[2]]

# training KFDA model
kfda.model <- kfda(trainData = trainData, kernel.name = "rbfdot")

# testing new(test) data by KFDA model
pre <- kfda.predict(object = kfda.model, testData = testData)

# plotting
plot(kfda.model$LDs, col = kfda.model$label, pch = 19, main = "Plot for KFDA")
points(pre$x, col = pre$class, cex = 2)
legend("topleft", legend = c("trainData","testData"), pch = c(19,1))

# prediction result
table(pre$class, (testData.label))
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