Package ‘NetDA’

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Metrics

Description

Implementation of discriminant analysis with network structures in predictors accommodated to do classification and prediction.

Details

There are two functions in this package: NetDA and Metrics. NetDA aims to construct network-based linear discriminant function and network-based quadratic discriminant function based on the training data, and then do classification for individuals in the testing data. Predicted values can be determined by NetDA. The function Metrics provides a confusion matrix and some commonly used criteria to assess the performance of classification and prediction.

Author(s)

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References


See Also

NetDA

Metrics

Description

Implementation of discriminant analysis with network structures in predictors accommodated to do classification and prediction.

Usage

Metrics(yhat,Y_test)
Arguments

yhat             an m-dimensional “vector” of the predicted values determined by NetDA.
Y_test           an m-dimensional “vector” of the response from the testing data.

Details

This function aims to report the performance of classification results. The output includes confusion matrices and some commonly used criteria, such as precision, recall, F-score, and ARI.

Value

Confusion matrix
A confusion matrix based on predicted values and responses from the testing data
(PRE, REC, F-score)
Values of precision (PRE), recall (REC), and F-score
ARI          Values of the adjusted Rand index (ARI)

Author(s)

Chen, L.-P.

References


See Also

NetDA

Examples

data(WineData)

Y = WineData[,1]    # the response
X = WineData[,2:14] # the predictors
D1 = WineData[which(Y==1),]
D2 = WineData[which(Y==2),]
D3 = WineData[which(Y==3),]
Train = rbind(D1[1:45,], D2[1:45,], D3[1:45,]) # user-specific training data
Test = rbind(D1[45:dim(D1)[1],], D2[45:dim(D2)[1],], D3[45:dim(D3)[1],]) # user-specific testing data
X = Train[,2:14]
Y = Train[,1]
X_test = Test[,2:14]
\( Y_{\text{test}} = \text{Test}[,1] \)

\[
\text{NetDA}(X,Y,\text{method}=1,X_{\text{test}}) \rightarrow \text{NetLDA} \\
\text{yhat}_\text{lda} = \text{NetLDA}\$\text{yhat} \\
\text{Metrics}(\text{yhat}_\text{lda},Y_{\text{test}}) \\
\]

\[
\rightarrow \text{NetQDA} \\
\text{yhat}_\text{qda} = \text{NetQDA}\$\text{yhat} \\
\text{Metrics}(\text{yhat}_\text{qda},Y_{\text{test}}) \\
\]

---

NetDA

*Network-Based Discriminant Analysis Subject to Multi-Label Classes*

**Description**

Implementation of discriminant analysis with network structures in predictors accommodated to do classification and prediction.

**Usage**

\[
\text{NetDA}(X,Y, \text{method},X_{\text{test}}) \\
\]

**Arguments**

- \( X \) an \((n,p)\) “matrix” of the predictors from the training data.
- \( Y \) an \(n\)-dimensional “vector” of the response from the training data.
- \( \text{method} \) a “scalar” to determine the classification method. “method = 1” represents network-based linear discriminant analysis (NetLDA); “method = 2” represents network-based quadratic discriminant analysis (NetQDA).
- \( X_{\text{test}} \) an \((m,p)\) “matrix” of the predictors from the testing data.

**Details**

This function is used for the classification using discriminant analysis with network structures in predictors. NetLDA is formulated by linear discriminant function with the corresponding estimated precision matrix obtained by pooling all subjects in the training data; NetLDA is formulated by quadratic discriminant function with the estimated precision matrices determined by stratifying subjects from the associated classes.

**Value**

- \( \text{yhat} \) a vector of predicted responses obtained by NetLDA or NetQDA.
- \( \text{Network} \) the estimators of confusion matrices.
Author(s)
Chen, L.-P.

References

Examples

```r
data(WineData)

Y = WineData[,1]  # the response
X = WineData[,2:14]  # the predictors

D1 = WineData[which(Y==1),]  # the first class
D2 = WineData[which(Y==2),]  # the second class
D3 = WineData[which(Y==3),]  # the third class

Train = rbind(D1[1:45,], D2[1:45,], D3[1:45,])  # user-specific training data
Test = rbind(D1[45:dim(D1)[1],], D2[45:dim(D2)[1],], D3[45:dim(D3)[1],])  # user-specific testing data

X = Train[,2:14]
Y = Train[,1]
X_test = Test[,2:14]
Y_test = Test[,1]

NetDA(X,Y,method=1,X_test) -> NetLDA

yhat_lda = NetLDA$yhat
Net_lda = NetLDA$Network

NetDA(X,Y,method=2,X_test) -> NetQDA

yhat_qda = NetQDA$yhat
Net_qda = NetQDA$Network
```

Description
The dataset, available at https://archive.ics.uci.edu/ml/datasets/wine, illustrates the usage of NetDA and Metrics functions. The dataset contains measurements of 178 units where the response is classified as three classes together with 13 relevant predictors.
Usage

data(WineData)

Format

The dataset contains one response, 13 predictors, and 178 subjects.

Examples

Y = WineData[,1]    # the response
X = WineData[,2:14]  # the predictors

D1 = WineData[which(Y==1),]
D2 = WineData[which(Y==2),]
D3 = WineData[which(Y==3),]

Train = rbind(D1[1:45,], D2[1:45,], D3[1:45,])  # user-specific training data
Test = rbind(D1[45:dim(D1)[1],], D2[45:dim(D2)[1],], D3[45:dim(D3)[1],])  # user-specific testing data

X = Train[,2:14]
Y = Train[,1]
X_test = Test[,2:14]
Y_test = Test[,1]
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