Package 'JSDNE'

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Title Estimating the Age using Auricular Surface by DNE

Version 4.6

Maintainer Jisun Jang <jisun.jang.19@ucl.ac.uk>

Description The age is estimated by calculating the Dirichlet Normal Energy (DNE) on the whole auricular surface and the apex of the auricular surface. It involves three estimation methods: principal component discriminant analysis (PCQDA), and principal component logistic regression analysis (PCLR) methods, principal component regression analysis with Southeast Asian (A_PCR), and principal component regression analysis with multipopulation (M_PCR). The package is created with the data from the Louis Lopes Collection in Lisbon, the 21st Century Identified Human Remains Collection in Coimbra, and the CAL Milano Cemetery Skeletal Collection in Milan, and the skeletal collection at Khon Kaen University (KKU) Human Skeletal Research Centre (HSRC), housed in the Department of Anatomy in the Faculty of Medicine at KKU in Khon Kaen.

License GPL-3

Encoding UTF-8

RoxygenNote 7.3.1

Depends R (>= 2.10)

LazyData true

Imports dplyr, MASS, molaR, nnet, Rvcg

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

Author Jisun Jang [aut, cre]

Repository CRAN

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Contents

`Apex` *Surface mesh of apex of auricular surface.*

Description

Surface mesh of apex of auricular surface.

Usage

```
data(Apex)
```

Format

An object of class `mesh3d` of length 4.

Examples

```
PCQDA_output <- PCQDA_result(WholeSurface,Apex)
PCR_output <- PCR_result(WholeSurface,Apex)
PCLR_output <- PCLR_result(WholeSurface,Apex)
```

A_PCR_result *Estimating the age using A_PCR method*

Description

A_PCR method is the principal component linear regression analysis with Southeast Asian (A_PCR) method using the Dirichlet Normal Energy (DNE). The function automatically calculates the DNE on the auricular surface It provides the estimated age and standard errors (SE, 9.0yrs).

Usage

```
A_PCR_result(x, y)
```

Arguments

x	the name of inputted ply file of the whole auricular surface
y	the name of inputted ply file of the apex of the auricular surface

Value

estimated result gets printed to the console

A_PCR_Test *A_PCR_Test*

Description

A_PCR_Test is the test set of the A_PCR model. It consists of Age, MeanDNE.Apex, Proportion.DNEunder0.0001, Proportion.DNEover0.6, IQRDNE.Whole. The number of rows is 66.

Usage

```
A_PCR_Test
```

Format

An object of class `data.frame` with 66 rows and 5 columns.

A_PCR_Train *A_PCR_Train*

Description

A_PCR_Train is the train set of the A_PCR model. It consists of Age, MeanDNE.Apex, Proportion.DNEunder0.0001, Proportion.DNEover0.6, IQRDNE.Whole. The number of rows is 269.

Usage

```
A_PCR_Train
```

Format

An object of class `data.frame` with 269 rows and 5 columns.

Distribution *Distribution*

Description

It shows the sex and age distribution of the multi-populational sample.

Usage

```
Distribution
```

Format

An object of class `data.frame` with 1225 rows and 3 columns.

FirstObservation *FirstObservation*

Description

FirstObservation is the raw data of DNE variables obtained from the first observation of the Southeast Asian sample. It consists of MeanDNE.Apex, MedianDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001 and Proportion.DNEover0.6.

Usage

```
FirstObservation
```

Format

An object of class `data.frame` with 140 rows and 10 columns.

MultiData *MultiData*

Description

MultiData is the combined data of M_PCR train and M_PCR test sets. It consists of Age, MeanDNE.Apex, MedianDNE.Apex, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001 and Population.

Usage

```
MultiData
```

Format

An object of class `data.frame` with 1225 rows and 7 columns.

M_PCR_result *Estimating the age using M_PCR method*

Description

M_PCR method is the principal component linear regression analysis with multi-population (M_PCR) method using the Dirichlet Normal Energy (DNE). The function automatically calculates the DNE on the auricular surface It provides the estimated age and standard errors (SE, 10.2yrs).

Usage

```
M_PCR_result(x, y)
```

Arguments

`x`	the name of inputted ply file of the whole auricular surface
`y`	the name of inputted ply file of the apex of the auricular surface

Value

estimated result gets printed to the console

M_PCR_Test *M_PCR_Train*

Description

M_PCR_Train is the test set of the M_PCR model. It consists of Age,MeanDNE.Apex,MedianDNE.Apex,MeanDNE.Convex
The number of rows is 272.

Usage

```
M_PCR_Test
```

Format

An object of class `data.frame` with 272 rows and 7 columns.

M_PCR_Train *M_PCR_Train*

Description

M_PCR_Train is the train set of the M_PCR model. It consists of Age, MeanDNE.Apex, MedianDNE.Apex, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001, Population.
The number of rows is 953.

Usage

```
M_PCR_Train
```

Format

An object of class `data.frame` with 953 rows and 7 columns.

PCLR_result *Estimating the age using DNE_PCLR method*

Description

DNE_PCLR method is the principal component logistic regression analysis (PCLR) method using the Dirichlet Normal Energy (DNE). This method involves 2 age groups to distinguish if the specimen is over 63 or under 67. The function automatically calculates the DNE on the auricular surface. It provides the estimated age group and age range of the estimated age group.

Usage

```
PCLR_result(x, y)
```

Arguments

x	the name of inputted ply file of the whole auricular surface
y	the name of inputted ply file of the apex of the auricular surface

Value

estimated result gets printed to the console

PCLR_Test *PCLR_Test*

Description

PCR_Train is the test set of the PCR model. It consists of Age, Cluster1, MeanDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole and MeanDNE.Convex. The number of rows is 191.

Usage

```
PCLR_Test
```

Format

An object of class `data.frame` with 191 rows and 7 columns.

PCLR_Train *PCLR_Train*

Description

PCLR_Train is the train set of the PCR model. It consists of Age, Cluster1, MeanDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole and MeanDNE.Convex. The number of rows is 699.

Usage

```
PCLR_Train
```

Format

An object of class `data.frame` with 699 rows and 7 columns.

PCQDA_result *Estimating the age using DNE_PCQDA method*

Description

DNE_PCQDA method is the principal component quadratic discriminant analysis (PCQDA) method using the Dirichlet Normal Energy (DNE). This method involves 4 age groups. The function automatically calculates the DNE on the auricular surface. It provides the estimated age group and age range of the estimated age group.

Usage

```
PCQDA_result(x, y)
```

Arguments

x	the name of inputted ply file of the whole auricular surface
y	the name of inputted ply file of the apex of the auricular surface

Value

estimated result gets printed to the console

PCQDA_Test *PCQDA_Test*

Description

PCQDA_Test is the test set of the PCQDA model. It consists of Cluster2, Age, MeanDNE.Apex, TotalDNE.TotalPolygonFaces, Proportion.DNEunder0.0001, and Proportion.DNEover0.6. The number of rows is 186.

Usage

```
PCQDA_Test
```

Format

An object of class `data.frame` with 186 rows and 6 columns.

PCQDA_Train *PCQDA_Train*

Description

PCQDA_Train is the train set of the PCQDA model. It consists of Cluster2, Age, MeanDNE.Apex, TotalDNE.TotalPolygonFaces, Proportion.DNEunder0.0001, and Proportion.DNEover0.6. The number of rows is 704.

Usage

```
PCQDA_Train
```

Format

An object of class `data.frame` with 704 rows and 6 columns.

PCR_result *Estimating the age using PCR method*

Description

DNE_PCR method is the principal component linear regression analysis (PCR) method using the Dirichlet Normal Energy (DNE). The function automatically calculates the DNE on the auricular surface It provides the estimated age and standard errors (SE).

Usage

```
PCR_result(x, y)
```

Arguments

x	the name of inputted ply file of the whole auricular surface
y	the name of inputted ply file of the apex of the auricular surface

Value

estimated result gets printed to the console

PCR_Test *PCR_Test*

Description

PCR_Train is the test set of the PCR model. It consists of Age, MeanDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MeanDNE.Convex and Proportion.DNEunder0.0001. The number of rows is 188.

Usage

```
PCR_Test
```

Format

An object of class `data.frame` with 188 rows and 6 columns.

PCR_Train *PCR_Train*

Description

PCR_Train is the train set of the PCR model. It consists of Age, MeanDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MeanDNE.Convex and Proportion.DNEunder0.0001. The number of rows is 702.

Usage

```
PCR_Train
```

Format

An object of class `data.frame` with 702 rows and 6 columns.

RawData *RawData*

Description

It is the raw data of the DNE variables obtained from the European sample to develop the PCQDA, PCLR, and PCR models. It consists of Age, Cluster1, Cluster2, Collection, Sex, MeanDNE.Apex, MedianDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001 and Proportion.DNEover0.6.

Usage

```
RawData
```

Format

An object of class `data.frame` with 890 rows and 15 columns.

`SecondObservation` *SecondObservation*

Description

SecondObservation is the raw data of DNE variables obtained from the second observation of the Southeast Asian sample. It consists of MeanDNE.Apex, MedianDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001 and Proportion.DNEover0.6.

Usage

```
SecondObservation
```

Format

An object of class `data.frame` with 140 rows and 10 columns.

`ThaiData` *ThaiData*

Description

ThaiData is the raw data of the DNE variables obtained from the Southeast Asian sample to develop the A_PCR and M_PCR models. It consists of Age, MeanDNE.Apex, MedianDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001, Proportion.DNEover0.6, PCQDA_Estimated (results of PCQDA model) and PCR_pred (results of PCR model) , PCLR_pred (results of PCLR model).

Usage

```
ThaiData
```

Format

An object of class `data.frame` with 335 rows and 14 columns.

TrendLine *TrendLine*

Description

TrendLine is the combined data of European and Southeast Asian samples. It consists of Age, MeanDNE.Apex, MedianDNE.Apex, IQRDNE.Apex, TotalDNE.TotalPolygonFaces, MedianDNE.Whole, IQRDNE.Whole, MeanDNE.Convex, MeanDNE.Concave, Proportion.DNEunder0.0001, Proportion.DNEover0.6 and Population.

Usage

```
TrendLine
```

Format

An object of class `data.frame` with 1225 rows and 12 columns.

WholeSurface *Surface mesh of whole auricular surface.*

Description

Surface mesh of whole auricular surface.

Usage

```
data(WholeSurface)
```

Format

An object of class `mesh3d` of length 4.

Examples

```
PCQDA_output <- PCQDA_result(WholeSurface,Apex)
PCR_output <- PCR_result(WholeSurface,Apex)
PCLR_output <- PCLR_result(WholeSurface,Apex)
```

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