

Package: otoclass (via r-universe)

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Type Package

Title Otolith Classification and Proportion Estimation

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Description Methods for classification and analysis of otoliths along with methods for estimating species proportions in samples.

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Imports Rcpp (>= 0.11.2), TMB, stats, jpeg, png, tiff, Matrix (>= 1.5-0), methods, graphics, expm, lme4

Suggests shiny

LinkingTo RcppEigen, TMB

RoxygenNote 7.1.1

Repository <https://calbertsen.r-universe.dev>

RemoteUrl <https://github.com/calbertsen/otoclass>

RemoteRef feature/multi_group

RemoteSha 7063e7b3cb3502c3d1356043600bdfed84225603

Contents

as.otolith_contour_list	2
assign_unknown	3
efd	4
efd2coord	5
efd2coordOld	6
fcbf	6
flip	7
fs	8
gen2PCA	8
getGroupMeans	9
getGroupProportion	9

getPixelMatrix	10
interpolate	10
knn	11
mlcd	11
mllc	12
normalize_image	14
plot.otolith_contour	14
plot.otolith_contour_list	15
plot.otolith_image	16
polygon_area	16
print.otolith_contour	17
print.otolith_image	17
projection	18
read.gen	18
read_image	19
read_images	21
rotate	21
runShinyExample	22

Index	23
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as.otolith_contour_list
Convert to otolith_contour_list

Description

Convert to otolith_contour_list

Usage

```
as.otolith_contour_list(x, ...)
```

Arguments

x	otolith_contour object or output from read_image
...	other parameters

Value

otolith_contour_list object

Author(s)

Christoffer Moesgaard Albertsen

assign_unknown	<i>Assign unknown contours by binomial regression on elliptic fourier descriptors</i>
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Description

Assign unknown contours by binomial regression on elliptic fourier descriptors

Usage

```
assign_unknown(  
  nimList,  
  N = 60,  
  delta = 0.01,  
  lambda = 1,  
  link = "probit",  
  normalize_efd = FALSE  
)
```

Arguments

nimList	A list of normalized contours
N	Number of harmonics for the fourier descriptors
delta	passed to fcbf for feature selection
lambda	passed to fcbf for feature selection
link	Link function passed to stats::glm
normalize_efd	Should EFDs be normalized?

Value

A list of normalized contours where 'Unknown' Position attributes are replaced by 'Left' or 'Right'.

Author(s)

Christoffer Moesgaard Albertsen

efd

Calculate Elliptical Fourier Descriptors

Description

Calculate Elliptical Fourier Descriptors

Usage

```
efd(x, N, ...)  
  
## S3 method for class 'matrix'  
efd(x, N, returnAsList = FALSE, normalize = FALSE, ...)  
  
## S3 method for class 'otolith_contour'  
efd(x, N, ...)  
  
## S3 method for class 'otolith_image'  
efd(x, N, ...)  
  
## S3 method for class 'otolith_contour_list'  
efd(x, N, ...)
```

Arguments

x	contour object
N	Number of harmonics to calculate
...	other arguments
returnAsList	Should result be returned as a list that can be passed to efd2coord?
normalize	Normalize using method from Ferson et al. 1985?

Value

List of elliptical fourier descriptors

Author(s)

Christoffer Moesgaard Albertsen

References

Kuhl, F. P., Giardina, C. R. (1981) Elliptic Fourier Features of a Closed Contour. *Computer Graphics and Image Processing*. 18:236-258 Ferson, S., Rohlf, F. J., Koehn, R. K. (1985) Measuring Shape Variation of Two-Dimensional Outlines. *Systematic Zoology*. 34(1):59-68

Examples

```
Ellipsis <- function(theta,r1=1,r2=2){
  xx <- seq(0,2*pi,len=100)
  X <- cbind(r1*cos(xx),r2*sin(xx))
  R <- matrix(c(cos(theta),sin(theta),-sin(theta),cos(theta)),2,2)
  Y <- t(apply(X,1,function(x) as.vector(R %*% x)))
  return(Y)
}
efd(Ellipsis(pi/2),1)

efd(Ellipsis(pi/2),1,normalize = TRUE)

efd(Ellipsis(-pi/2),1,normalize = TRUE)
```

efd2coord

Calculate XY-coordinates from Elliptical Fourier Descriptors

Description

Calculate XY-coordinates from Elliptical Fourier Descriptors

Usage

```
efd2coord(n, A, B, C, D, A0 = 0, C0 = 0)
```

Arguments

n	Number of coordinates to calculate
A	A EFD coefficients
B	B EFD coefficients
C	C EFD coefficients
D	D EFD coefficients
A0	A0 EFD coefficients
C0	C0 EFD coefficients

Value

Matrix of coordinates

Author(s)

Christoffer Moesgaard Albertsen

efd2coord01d *Calculate XY-coordinates from Elliptical Fourier Descriptors*

Description

Calculate XY-coordinates from Elliptical Fourier Descriptors

Usage

```
efd2coord01d(n, A, B, C, D, A0 = 0, C0 = 0)
```

Arguments

n	Number of coordinates to calculate
A	A EFD coefficients
B	B EFD coefficients
C	C EFD coefficients
D	D EFD coefficients
A0	A0 EFD coefficients
C0	C0 EFD coefficients

Value

Matrix of coordinates

Author(s)

Christoffer Moesgaard Albertsen

fcbf *Fast Correlation Based Filter for Feature Selection in High-Dimensional Data*

Description

Fast Correlation Based Filter for Feature Selection in High-Dimensional Data

Usage

```
fcbf(
  train,
  group,
  delta,
  lambda = 1,
  nCuts = function(x) { round(length(unique(x))/5) }
)
```

Arguments

train	A matrix of training data
group	A vector of groups
delta	Tuning parameter
lambda	Tuning parameter
nCuts	Function that calculates number of bins used for calculating correlations

Value

A vector of selected features

Author(s)

Christoffer Moesgaard Albertsen

References

http://pdf.aminer.org/000/335/746/feature_selection_for_high_dimensional_data_a_fast_correlation_based.pdf

flip

Flip an otolith

Description

Flip an otolith

Usage

```
flip(x, axis, ...)
```

Arguments

x	otolith object
axis	axis to flip around
...	not used

Value

a flipped otolith object

Author(s)

Christoffer Moesgaard Albertsen

fs *Fourier Series Basis for Splines*

Description

Fourier Series Basis for Splines

Usage

```
fs(x, N, Boundary = range(x))
```

Arguments

x	the predictor variable
N	Half the number of basis functions. Both a cos and a sin basis function will be added.
Boundary	Boundary points that determines a period

Value

A matrix of dimension 'c(length(x), 2*N)'.

Author(s)

Christoffer Moesgaard Albertsen

gen2PCA *Prepare allele matrix for PCA analysis*

Description

Prepare allele matrix for PCA analysis

Usage

```
gen2PCA(x, alleleMeans)
```

Arguments

x	output from <code>linkread.gen</code>
alleleMeans	Mean allele frequencies to impute. Is calculated if missing.

Value

allele data for PCA analysis

Author(s)

Christoffer Moesgaard Albertsen

getGroupMeans *Calculate group means for a data frame of covariates*

Description

Calculate group means for a data frame of covariates

Usage

```
getGroupMeans(f, data, ...)  
  
## S3 method for class 'm1ld'  
getGroupMeans(f, data, keep.cov = FALSE, ...)
```

Arguments

f
data

Author(s)

Christoffer Moesgaard Albertsen

getGroupProportion *Calculate group proportions for a data frame of covariates*

Description

Calculate group proportions for a data frame of covariates

Usage

```
getGroupProportion(f, data, ...)  
  
## S3 method for class 'm1ld'  
getGroupProportion(f, data, randEff = TRUE, ...)
```

Arguments

f
data

Author(s)

Christoffer Moesgaard Albertsen

getPixelMatrix *Get a pixel matrix from an image file*

Description

Get a pixel matrix from an image file

Usage

```
getPixelMatrix(file, grey = TRUE)
```

Arguments

file	Path to image file
grey	Should output be greyscale?

Value

A matrix of pixel values (0-255)

Author(s)

Christoffer Moesgaard Albertsen

interpolate *Interpolate otolith coordinates through EFDs*

Description

Interpolate otolith coordinates through EFDs

Usage

```
interpolate(x, N, Nefd, ...)
```

Arguments

x	otolith object
N	Number of coordinates to output
Nefd	Number of EFDs to use
...	not used

Value

an interpolated otolith object

Author(s)

Christoffer Moesgaard Albertsen

knn *k Nearest Neighbour*

Description

knn returns the votes to each level factor(group) from the kn nearest neighbours to test from train.

Usage

```
knn(train, group, test, kn = 1, dist = c("L2", "L1", "Linf"))
```

Arguments

train	A matrix of (continuous) features for the training sample
group	A vector of group labels for the training sample
test	A matrix of (continuous) features for the test sample
kn	Number of neighbours to consider
dist	Distance measure to use ("L1", "L2", "Linf"). Default is Euclidian distance ("L2").

mlcd *Maximum Likelihood Contour Discrimination*

Description

Maximum Likelihood Contour Discrimination

Usage

```
mlcd(
  train,
  group,
  test,
  prior = as.vector(table(group))/length(group),
  penalty = 0,
  lambda = 0.4,
  Nefd = 60,
  correlatedCoordinates = FALSE,
  equalVariance = TRUE,
  silent = FALSE,
  control = list(iter.max = 1e+05, eval.max = 1e+05),
  ...
)
```

Arguments

train	3D Array of training data (2 x number of contour points x number of observations)
group	Factor of training groups
test	3D array of test data
prior	Prior probability of groups
penalty	p to use for Lp penalty. Zero is no penalty.
lambda	Positive scalar factor for Lp penalty. Zero is no penalty.
Nefd	Number of EFDs to use for mean otolith
correlatedCoordinates	Should coordinates be correlated?
equalVariance	Should the variance be equal in the two coordinates?
silent	Should the TMB object be silent?
control	control parameters passes to nlminb
...	Other parameters

Value

a list of the result

Author(s)

Christoffer Moesgaard Albertsen

mlld

Maximum likelihood linear discrimination

Description

Maximum likelihood linear discrimination

Usage

```
mlld(
  y,
  group,
  data = NULL,
  formula = ~1,
  formulaCommon = ~1,
  formulaProportion = ~1,
  formulaLogScale = ~-1,
  equalLogScale = FALSE,
  lp_penalty = NA,
  lambda = 0.4,
```

```
estimateLambda = TRUE,
REML = FALSE,
tMixture = 0,
tDf = 5,
estimateTMix = FALSE,
sameTMix = FALSE,
estimateTDf = FALSE,
sameTDf = FALSE,
independent = FALSE,
silent = FALSE,
control = list(iter.max = 1e+05, eval.max = 1e+05),
drop.unused.levels = TRUE,
onlyObj = FALSE,
doSdreport = TRUE,
getReportCovariance = TRUE,
equalVariance = TRUE,
confusionMatrixList = NULL,
groupConversionList = list(),
confusionLevelTypes = rep("Known", ifelse(is.null(ncol(group)), 1, ncol(group))),
observationType = c("MVMIX", "SNP1", "SNP2", "SPL_AR1", "FS1_AR1", "SPL_CATEGORICAL"),
forceMeanIncrease = FALSE,
fixZeroGradient = TRUE,
SNP2dm = FALSE,
sameSNP2dm = TRUE,
SPLknots = NULL,
Nefd = 5,
lower = list(),
upper = list(),
guessStartingValues = TRUE,
imputeMissing = FALSE,
...
)
```

Arguments

```
...
proportionGroup

confusionGroup
```

Author(s)

Christoffer Moesgaard Albertsen

normalize_image *Normalize an Otolith Image*

Description

Normalize an Otolith Image

Usage

```
normalize_image(
  dat,
  n,
  datCompare = NULL,
  forceFlip = FALSE,
  flipByPosition = c("No", "Left", "Right", startByPolar = FALSE)
)
```

Arguments

dat	otolith_image object
n	Number of coordinates to output
datCompare	Data to compare with
forceFlip	Force a flip of the otolith?
flipByPosition	Position (Left/Right) to flip. Use 'No' if otoliths should not be flipped by position.

Value

A normalized Otolith Image

Author(s)

Christoffer Moesgaard Albertsen

plot.otolith_contour *Plot otolith contour*

Description

Plot otolith contour

Usage

```
## S3 method for class 'otolith_contour'
plot(x, asUsed = FALSE, ...)
```

Arguments

x	Otolith contour
asUsed	Plot image as read; i.e. transformed
...	further arguments

Value

nothing

Author(s)

Christoffer Moesgaard Albertsen

plot.otolith_contour_list
Plot otolith contour list

Description

Plot otolith contour list

Usage

```
## S3 method for class 'otolith_contour_list'  
plot(x, asUsed = FALSE, ask = TRUE, ...)
```

Arguments

x	Otolith contour list
asUsed	Plot image as read; i.e. transformed
ask	Ask before plotting next contour?
...	further arguments

Value

nothing

Author(s)

Christoffer Moesgaard Albertsen

plot.otolith_image *Plot otolith image*

Description

Plot otolith image

Usage

```
## S3 method for class 'otolith_image'  
plot(x, asUsed = FALSE, ...)
```

Arguments

x	Otolith image
asUsed	Plot image as read; i.e. transformed
...	further arguments

Value

nothing

Author(s)

Christoffer Moesgaard Albertsen

polygon_area *Signed area of a closed polygon*

Description

The function uses the shoelace formula to calculate the signed area of a closed non-intersecting polygon.

Usage

```
polygon_area(X)
```

Arguments

X	A numeric matrix with two columns of vertices
---	---

Value

Polygon area in same units as input

Author(s)

Christoffer Moesgaard Albertsen

print.otolith_contour *Print otolith image contour*

Description

Print otolith image contour

Usage

```
## S3 method for class 'otolith_contour'  
print(x, ...)
```

Arguments

x	Otolith image contour
...	further arguments

Value

nothing

Author(s)

Christoffer Moesgaard Albertsen

print.otolith_image *Print otolith image*

Description

Print otolith image

Usage

```
## S3 method for class 'otolith_image'  
print(x, ...)
```

Arguments

x	Otolith image
...	further arguments

Value

nothing

Author(s)

Christoffer Moesgaard Albertsen

projection	<i>LDA-like projection</i>
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Description

LDA-like projection

Usage

```
projection(x, ...)
```

Arguments

x
...

Author(s)

Christoffer Moesgaard Albertsen

read.gen	<i>Read genepop data files</i>
----------	--------------------------------

Description

Read genepop data files

Usage

```
read.gen(  
  f,  
  pop.names,  
  sort.loci = FALSE,  
  sort.individuals = FALSE,  
  NAlleleKeep = NA  
)
```

Arguments

f file name
 pop.names population names. If missing, the ID of the last individual is used
 sort.loci Should loci be sorted by names?
 sort.individuals Should individuals be sorted by id?

Value

an allele array

Author(s)

Christoffer Moesgaard Albertsen

read_image *Read Otolith Images and Extract Contours*

Description

Read Otolith Images and Extract Contours

Usage

```
read_image(
  file,
  noiseFactor = NULL,
  onlyOne = FALSE,
  minPixelDiff = 0.05 * min(nc, nr),
  extreme = TRUE,
  floodFillTolerance = 0.1,
  floodFillCol = 0,
  whiteBalance = 0.4,
  histogramAlpha = 0.4,
  borderBasedCutOff = FALSE,
  transformations = character(0),
  logisticTransformLocation = c("mean", "median", "borderMean", "borderMedian"),
  logisticTransformScale = 1,
  gaussianBlurSize = round(0.02 * min(nc, nr)),
  gaussianBlurSigma = gaussianBlurSize/10,
  pixelwise = FALSE,
  assignSinglesByPosition = TRUE,
  forceCenter = TRUE,
  minCountScale = 0,
  minCountForMax = 1e-04,
  reduceCutOffPercent = 0,
  zeroCutOffPercent = 0.05
)
```

Arguments

file	Image file path
noiseFactor	Scalar value determining cutoff value for background noise on image. If NULL, a value is calculated automatically.
onlyOne	Boolean value. Is there only one otolith on the image?
minPixelDiff	Minimum pixel difference between otoliths
extreme	Boolean value. Should pixel values be converted to 0/1?
borderBasedCutOff	Use a border based cut off?
transformations	Vector of image transformations: logistic, gaussianBlur, unsharp, floodFill
logisticTransformLocation	Location parameter for logistic transformation
logisticTransformScale	Scale parameter for logistic transformation
gaussianBlurSize	Size (n x n) for Gaussian blur kernel
gaussianBlurSigma	Variance parameter of Gaussian distribution used to blur
pixelwise	Boolean value. If TRUE, a pixel-wise algorithm is used to extract contours; otherwise, grDevices::contourLines is used.
assignSinglesByPosition	Should single otoliths be assigned to Left/Right based on position on image?
minCountScale	See details
minCountForMax	See details
reduceCutOffPercent	See details
zeroCutOffPercent	See details

Value

otolith image object

Author(s)

Christoffer Moesgaard Albertsen

read_images	<i>Extract otolith contours from images</i>
-------------	---

Description

Extract otolith contours from images

Usage

```
read_images(files, ...)
```

Arguments

files	file paths to read
...	Arguments passed to read_image

Value

an otolith_contour_list object

Author(s)

Christoffer Moesgaard Albertsen

See Also

read_image

rotate	<i>Rotate an otolith</i>
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Description

Rotate an otolith

Usage

```
rotate(x, angle, degrees = TRUE, ...)
```

Arguments

x	object to rotate
angle	Angles to rotate the object
degrees	Is the angle in degrees?
...	not used

Value

A rotated element

Author(s)

Christoffer Moesgaard Albertsen

runShinyExample

Run shiny example included in the package

Description

Run shiny example included in the package

Usage

```
runShinyExample(name)
```

Arguments

name Name of the shiny example (biascorrect, or proportion)

Value

Nothing

Author(s)

Christoffer Moesgaard Albertsen

Index

[as.otolith_contour_list](#), 2
[assign_unknown](#), 3

[efd](#), 4
[efd2coord](#), 5
[efd2coord0ld](#), 6

[fcbf](#), 6
[flip](#), 7
[fs](#), 8

[gen2PCA](#), 8
[getGroupMeans](#), 9
[getGroupProportion](#), 9
[getPixelMatrix](#), 10

[interpolate](#), 10

[knn](#), 11

[m1cd](#), 11
[m1ld](#), 12

[normalize_image](#), 14

[plot.otolith_contour](#), 14
[plot.otolith_contour_list](#), 15
[plot.otolith_image](#), 16
[polygon_area](#), 16
[print.otolith_contour](#), 17
[print.otolith_image](#), 17
[projection](#), 18

[read.gen](#), 18
[read_image](#), 19
[read_images](#), 21
[rotate](#), 21
[runShinyExample](#), 22