Package 'tlemix'

February 20, 2015

Type Package

Title Trimmed Maximum Likelihood Estimation

Version 0.1.3

Date 2013-08-23

Author P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela

Depends R (>= 2.10), methods

Suggests mvtnorm, tcltk, flexmix

Maintainer Peter Filzmoser <P.Filzmoser@tuwien.ac.at>

Description TLE implements a general framework for robust fitting of
finite mixture models. Parameter estimation is performed using
the EM algorithm.

License GPL (>= 3)

LazyLoad yes

Repository CRAN

Date/Publication 2013-08-23 14:09:27

NeedsCompilation no

R topics documented:

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tlemix-package   *TLE - Robust Estimation of Mixture Models using the Fast-TLE algorithm.*

Description

TLE implements a general framework for robust fitting of finite mixture models. Parameter estimation is performed using the EM algorithm.

Details

Package:	tlemix
Type:	Package
Version:	1.0
Date:	2008-06-12
License:	GPL-2
LazyLoad:	yes

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela Maintainer: P. Filzmoser, peter.filzmoser@tuwien.ac.at

References

N. Neykov, P. Filzmoser, R. Dimova, and P. Neytchev. Robust fitting of mixtures using the trimmed likelihood estimator. Computational Statistics and Data Analysis, Vol. 17(3), pp. 299-308, 2007.

See Also

flexmix, TLE

---

coefglm   *coefglm*

Description

Used by TLE-flexmix guassian, poisson & binomial model (FLXglm.Estimate) driver to get model coefficients.

Usage

```
coefglm(nmix, family)
```

Arguments

nmix	flexmix model
family	family, can be "gaussian", "poisson" or "binomial"

Value

List of model coefficients.

Note

This function is only used internally.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

See Also

TLE

---

coefmclust   *coefmclust*

Description

Returns coefficients of mclust type estimate. This function is only used internally.

Usage

```
coefmclust(nmix)
```

Arguments

nmix   Object of type `flexmix`.

Value

cov   Description of 'comp1'

center   Description of 'comp2'

prior   Description...

Note

This function is only used internally.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
<http://www.statistik.tuwien.ac.at/public/filz/>

See Also

[coef](), [parameters]()

---

dPois   *Mixture two Poisson Regression Models*

Description

In this data set we consider two Poisson regression models with equal mixing proportions and with additional noise. For each Poisson regression model 100 data points are generated according to a Poisson distribution. For the noise we generated 50 points from a uniform distribution over the range of each variate.

Usage

```
data(dPois)
```

Format

A data frame with 150 observations on the following 3 variables.

y A numeric vector of y-coordinates

x A numeric vector of x-coordinates

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
<http://www.statistik.tuwien.ac.at/public/filz/>

See Also

[TLE](#)

Examples

```
data(dPois)
str(dPois)
# Example needs some computing time:
# est.tle <- TLE(y~x,"poisson",data=dPois,Density=flexmix.Density,
#           Estimate=flexmix.Estimate,msglvl=1,nc=2,kTrim=200,class="hard")
# tleplot(est.tle,dPois)
```

---

estimate	*Getter for estimate object of TLE-ojbects.*

Description

This is the `estimate` function for TLE objects. It returns the estimate slot of TLE objects.

Usage

```
estimate(object)
```

Arguments

object	Object of class TLE

Value

object	Estimate object that is returned by the model driver's estimate function.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

See Also

[TLE](#)

---

flexmix.Density   *Model driver for flexmix*

Description

Density function according to current parameter estimate

Usage

```
flexmix.Density(data, pars,model,family)
```

Arguments

data	Model data, expected to be model.frame with family attribute
pars	Model estimate
model	The model
family	The model family

Value

ll	Log-likelihood
c	Cluster
cc	Cluster as matrix
lik	Log-likelihood

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

See Also

flexmix

---

flexmix.Estimate   *Flexible Mixture Estimation*

Description

TLE - flexmix gaussian, poisson & binomial model driver. Calculates the density function according to current parameter estimates.

Usage

```
flexmix.Estimate(data, ind = NULL, nc, class = "hard", cluster = NULL,
        niter = 200, minprior = 0.1, model,family,ntry=9)
```

Arguments

data	A model.frame containing the data.
ind	Data subset
nc	Number of clusters
class	Classification method used: auto, weighted, hard or random
cluster	optional vector of working class memberships
niter	Number of iterations
minprior	Minimum number of observations per component
model	The model
family	The model family
ntry	Number of trials

Value

Returns flexmix class estimate.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela

See Also

[flexmix](#)

FLXmclust.Density   *Model driver for flexmix*

Description

Density function according to current parameter estimate

Usage

```
FLXmclust.Density(data, estim,model,...)
```

Arguments

data	Model data, expected to be model.frame with family attribute
estim	Model estimate
model	The model used
...	Any other arguments

Value

ll	Log-likelihood
lc	Log-likelihood by cluster
c	Cluster
cc	Cluster as matrix.
lik	Log-likelihood.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

See Also

flexmix

FLXmclust.Estimate *Flexible Mixture Estimation*

Description

TLE - flexmix mclust model driver

Usage

```
FLXmclust.Estimate(data, ind = NULL, nc, class = "hard", cluster = NULL,
        niter = 200, minprior = 0.1, model = NULL,ntry=9,...)
```

Arguments

data	A model.frame containing the data.
ind	Data subset
nc	Number of clusters
class	Classification method used: auto, weighted, hard or random
cluster	optional vector of working class memberships
niter	Number of iterations
minprior	Minimum number of observations per component
model	Model used to extract model formula
ntry	Number of trials
...	Any other arguments

Value

Returns flexmix class estimate.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
<http://www.statistik.tuwien.ac.at/public/filz/>

See Also

flexmix

gaussData	*Mixture of two standard normal distributions*

Description

Mixture of two standard normal distributions with outliers.

Usage

```
data(gaussData)
```

Format

A data frame with 100 observations on the following 3 variables.

x a numeric vector of x-coordinates

y a numeric vector of y-coordinates

c a numeric vector of cluster memberships

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
<http://www.statistik.tuwien.ac.at/public/filz/>

Examples

```
data(gaussData)
str(gaussData)
# Example needs some computing time:
# estimate
# est.tle <- TLE(y~x,"gaussian",data=gaussData,Density=flexmix.Density,
#            Estimate=flexmix.Estimate,msglvl=1,nc=2,class="hard")
# plot data indicating clusters
# tleplot(est.tle,gaussData,main="TLE Scatter Plot")
```

McLachlan150	*Mixture of two standard normal distributions*

Description

This simulated data set are discussed by McLachlan and Peel (2000). The data consists of 100 observations generated from a 3-component bivariate normal mixture model with equal mixing proportions. Fifty outliers, generated from a uniform distribution over the range -10 to 10 on each variate are added to the original data. Thus a sample of 150 observations is obtained.

Usage

```
data(McLachlan150)
```

Format

A data frame with 100 observations on the following 3 variables.

x a numeric vector of x-coordinates

y a numeric vector of y-coordinates

c a numeric vector of cluster memberships

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

References

McLachlan, G.J. and Peel, D. (2000). Finite mixture models. Wiley, New York.

Examples

```
data(McLachlan150)
str(McLachlan150)
# Example needs some computing time:
#d <- as.matrix(McLachlan150[,1:2])
#est.tle <- TLE(d~1,"mvtnormal",data=d,Density=FLXmclust.Density,
#          Estimate=FLXmclust.Estimate,msglvl=1,nc=3,class="hard")
#tleplot(est.tle,as.data.frame(d),main="TLE Scatter Plot")
```

---

  plot-methods   *Plot method for TLE-class objects.*

Description

This is the `plot` function for TLE objects. It calls the plot function of the estimate object that is
returend by `estimate`

Usage

```
## S4 method for signature 'TLE,missing'
plot(x, y=NULL,...)
```

Arguments

x   Object of class TLE.

y   NULL

...   Additional plot parameters.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

See Also

TLE

---

summary   *Summary method for TLE-class objects.*

Description

This is the `summary` function for TLE objects. It extends the summary functions of the estimate object's class by adding TLE specific results.

Usage

```
summary(object, ...)
```

Arguments

object   Object of class TLE

...   Additional arguments for summary method of the estimate object.

Details

The following list shows the parameters and results that are added to the estimate object's summary function.

- kTrimTrimming parameter.
- nobsNumber of observations.
- noutNumber of outliers.

Value

summary   Object of class summary.TLE

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

---

summary.TLE-class *Class "summary.TLE"*

Description

Class for summary objects for TLE.

Objects from the Class

Objects can be created by calls of the form new("summary.TLE", ...).

Slots

call: Call of the function.

estimate: Estimate object. Class is determined by the estimation procedure used.

kTrim: Number of observations used.

kStar: Size of the initial random subsample.

maxloglik: Maximum log likelihood.

nobs: Number of observations.

nout: Number of outliers.

Methods

show signature(object = "summary.TLE"): ...

Author(s)

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<http://www.statistik.tuwien.ac.at/public/filz/>

TLE *Trimmed Likelihood Estimator*

Description

TLE implements a general framework for robust fitting of finite mixture models. Parameter estimation is performed using the EM algorithm.

Currently two model drivers are inluded: flexmix.Density (flexmix.Enstimate) for gaussian, poisson and binomial regression models and FLXmclust.Density (FLXmclust.Estimate) for model based clustering.

Usage

```
TLE(formula,family,data,kStar=NULL, kTrim=NULL, nit = 10, msglvl = 0,
        result = NULL, cit = 9, test = NULL,nc=1, Density, Estimate, ...)
```

Arguments

formula	An object of class formula.
family	The family to be used.
data	Data frame containing the x and y variables with an optional attribute family being either gaussian,poisson or binomial
kStar	k*- size of the initial random subsample
kTrim	Trimming parameter: size of the C-steps random subsample
nit	Number of iterations
msglvl	Level of messages
result	Restart/continuation information
cit	Number of iterations in refinement step
test	Expected true loglikelihood of the model; procedure will be stopped if reached.
nc	Number of components.
Density	Density function of type - function(data,solution,model,family,...)
Estimate	Specific estimation procedure interface: function(data,ind,model,family,...)
...	Arguments to be passed to methods Estimate and Density

Value

Returns an object of class TLE.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

References

N. Neykov, P. Filzmoser, R. Dimova, and P. Neytchev. Robust fitting of mixtures using the trimmed likelihood estimator. Computational Statistics and Data Analysis, Vol. 17(3), pp. 299-308, 2007.

See Also

flexmix

Examples

```
data(gaussData)
# This example takes some seconds:
#est.tle <- TLE(y~x,"gaussian",data=gaussData,nit=4, msglvl=1, cit=3,
#          Density=flexmix.Density, Estimate=flexmix.Estimate, nc=2)

# Plot the 2-dimensional data
#tleplot(est.tle, gaussData)
```

`TLE-class`   *Class "TLE"*

Description

Class for TLE results.

Slots

`estimate:` Estimate object. Class is determined by the estimation procedure used.

`iterbest:` Iteration with best result.

`it:` Number of iterations done.

`maxloglik:` Maximum loglikelihood.

`indbest:` Index of observations used during the final iteration.

`indout:` Index of the outliers.

`tleweights:` Matrix of weights. - Besprechen

`tlelogliks:` besprechen.

`tleclusters:` besprechen.

`kTrim:` Number of observations used.

`kStar:` Size of the initial random subsample.

`mcomp:` Number of components.

`nobs:` Number of observations.

`stop:` The expected loklikelihood of known model (used for testing).

`call:` Call of the function.

Methods

show Prints TLE object.

summary Generates a summary of a TLE object.

tleplot Plots a two-dimensional scatterplot with clusters and outliers marked by colors.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

References

N. Neykov, P. Filzmoser, R. Dimova, and P. Neytchev. Robust fitting of mixtures using the trimmed likelihood estimator. Computational Statistics and Data Analysis, Vol. 17(3), pp. 299-308, 2007.

TLE-methods | *Methods for Function TLE in Package 'tlemix'*

Description

Methods for function `TLE` in Package 'tlemix'

Methods

kStar = "numeric", kTrim = "numeric", data = "ANY", nit = "numeric", msglvl = "numeric", result = "ANY", cit =
TLE method

---

tleplot | *2D Scatterplot with cluster membership indications*

Description

The `tleplot` method for `TLE-class` objects gives a scatterplot of 2-dimensional mixture data after a trimmed likelihood estimation was performed.

Usage

```
tleplot(object, data, ...)
```

Arguments

object	object of class TLE (`TLE-class`)
data	2-dimensional data frame
...	further graphical parameters for the `plot` function

Details

A 2-dimensional data frame is represented as a scatterplot. For each cluster identified by the method `TLE` a different colour is used for indication purposes. Outliers are depicted as black triangles.

Author(s)

P. Neytchev, P. Filzmoser, R. Patnaik, A. Eisl and R. Boubela, <<P.Filzmoser@tuwien.ac.at>>
http://www.statistik.tuwien.ac.at/public/filz/

See Also

`TLE`

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