Package ‘advclust’

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Description S4 Object Oriented for Advanced Fuzzy Clustering and Fuzzy COnsensus Clustering. Techniques that provided by this package are Fuzzy C-Means, Gustafson Kessel (Babuska Version), Gath-Geva, Sum Voting Consensus, Product Voting Consensus, and Borda Voting Consensus. This package also provide visualization via Biplot and Radar Plot.
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  'class_validation.R' 'co.vote.R' 'cpair_fuzzy.R' 'fuzzy.CM.R'
  'fuzzy.GG.R' 'fuzzy.GK.R' 'is_Membership.R' 'membership.R'
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  'method_fuzzycluster_list.R' 'method_membership.R'
  'method_validation.R' 'minWeightBipartiteMatching.R'
  'print_Membership.R' 'print_co_fuzzycluster.R'
  'print_fuzzycluster.R' 'print_validation.R' 'radarplot.R'
  'validation.R' 'zzz.R'
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VignetteBuilder knitr
NeedsCompilation no
Repository CRAN
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asNmembership

As Membership/Membership Matrix

Description
Convert matrix to membership matrix

Usage
asNmembership(member)

Arguments
member membership matrix
Value

Membership Membership object

Slots

member membership matrix

hard.label hard label

Description

Biploting Fuzzy Cluster Result

Usage

biploting(object, data.X, scale)

Arguments

object a cluster object
data.X a data matrix that used for clustering
scale scaling option (T/F)

Details

Make Visualization Biplot from fuzzy cluster / consensus fuzzy cluster analysis result

Examples

fuzzy.CM(iris[,1:4],K=3,m=2,max.iteration=100,threshold=1e-5,RandomNumber=1234)->cl1
biploting(cl1,iris[,1:4])
Description

Provide consensus / ensemble fuzzy clustering with voting method. Several option for voting step provided.

Usage

co.vote(object, method)

Arguments

object a fuzzycluster_list object
method voting step that used to combine the partition ("sum","borda","product")

Details

Consensus clustering is method for combine several result of clustering into one robust result. This method used to overcome unstability of cluster result.

This function perform consensus clustering with voting approach. Voting approach look the domination of membership with several algorithm like sum rule, product rule and borda rule.

The differences of that method are how to combine several membership. Sum rule use Sum operation. Product rule use Product operation, and Borda use Borda count algorithm.

Value

Fuzzy Consensus Object

Slots

member membership matrix
hard.label hard.label
method.consensus method of consensus

References


Examples

fuzzy.CM(iris[,1:4],K=2,m=2,max.iteration=20,threshold=1e-3,RandomNumber=1234)->c11
fuzzy.GK(iris[,1:4],K=2,m=2,max.iteration=20,threshold=1e-3,RandomNumber=1234)->c12
fuzzy.CM(iris[,1:4],K=2,m=2,max.iteration=20,threshold=1e-3,RandomNumber=1234)->c13
c_fuzzycluster(c11,c12,c13)->CL
co.vote(CL,"borda")
co_fuzzycluster-class  Consensus Fuzzy Cluster Result

Description
Consensus Fuzzy Cluster Result

Slots
member  membership matrix
hard.label  vector of hard partition
method.consensus  method of fuzzy clustering used

co_fuzzycluster-class  Combine fuzzy cluster result

Description
combining fuzzy cluster result before ensembling

Usage
c_fuzzycluster(x, ...)

Arguments
x  a fuzzy cluster object
...  a fuzzy cluster object

Value
Fuzzy Clustering List

Slots
pair  pair list

Examples
fuzzy.CM(iris[,1:4],K=2,m=2,max.iteration=20,threshold=1e-3,RandomNumber=1234)->c11
c_fuzzycluster(c11,c12)
Description

Fuzzy C-Means clustering Algorithm (Bezdek, 1984)

Usage

fuzzy.CM(X, K, m, max.iteration, threshold, member.init, RandomNumber = 0, print.result = 0)

Arguments

- `X`: dataset (matrix/data frame)
- `K`: number of cluster
- `m`: fuzzyfier
- `max.iteration`: maximum iteration for convergence
- `threshold`: convergence criteria
- `member.init`: membership object or matrix that will be used for initialized
- `RandomNumber`: random number for start initializing
- `print.result`: print result (9/1)

Details

This function perform Fuzzy C-Means algorithm by Bezdek (1984). Fuzzy C-Means is one of fuzzy clustering methods to clustering dataset become K cluster. Number of cluster (K) must be greater than 1. To control the overlap or fuzziness of clustering, parameter m must be specified. Maximum iteration and threshold is specific number for convergencing the cluster. Random Number is number that will be used for seeding to firstly generate fuzzy membership matrix.

Clustering will produce fuzzy membership matrix (U) and fuzzy cluster centroid (V). The greatest value of membership on data point will determine cluster label. Centroid or cluster center can be use to interpret the cluster. Both membership and centroid produced by calculating mathematical distance. Fuzzy C-Means calculate distance with Euclidean norm.

Value

Fuzzy Clustering object

Slots

- `centroid`: centroid matrix
- `distance`: distance matrix
- `func.obj`: function objective
References


Examples

fuzzy.cPair(iris[,1:4],K=3,m=2,max.iteration=100,threshold=1e-5,RandomNumber=1234)

Description

Pairing fuzzy cluster

Usage

fuzzy.cPair(x, y)

Arguments

x an fuzzycluster object
y an fuzzycluster object
Description

Gath Geva for Fuzzy Clustering

Usage

fuzzy.GG(xL kL mL maxNiterationL thresholdL member.initL RandomNumber = 0, print.result = 0)

Arguments

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<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
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<td>x</td>
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</tr>
<tr>
<td>K</td>
<td>number of cluster</td>
</tr>
<tr>
<td>m</td>
<td>fuzzyfier</td>
</tr>
<tr>
<td>max.iteration</td>
<td>maximum iteration for convergence</td>
</tr>
<tr>
<td>threshold</td>
<td>convergence criteria</td>
</tr>
<tr>
<td>member.init</td>
<td>membership object or matrix that will be used for initialized</td>
</tr>
<tr>
<td>RandomNumber</td>
<td>random number for start initializing</td>
</tr>
<tr>
<td>print.result</td>
<td>print result (0/1)</td>
</tr>
</tbody>
</table>

Details

This function perform Gath Geva algorithm by Gath-Geva (1989). Gath Geva is one of fuzzy clustering methods to clustering dataset become K cluster. Number of cluster (K) must be greater than 1. To control the overalping or fuzziness of clustering, parameter m must be specified. Maximum iteration and threshold is specific number for convergencing the cluster. Random Number is number that will be used for seeding to firstly generate fuzzy membership matrix.

Clustering will produce fuzzy membership matrix (U) and fuzzy cluster centroid (V). The greatest value of membership on data point will determine cluster label. Centroid or cluster center can be use to interpret the cluster. Both membership and centroid produced by calculating mathematical distance. Gath Geva distance with Covariance Cluster and norm distribution assumption

Value

Fuzzy Clustering object

Slots

centroid centroid matrix
distance distance matrix
func.obj function objective
fuzzy.GK

call.func  called function
fuzzyfier  fuzzyness parameter
method.fuzzy  method of fuzzy clustering used
member  membership matrix
hard.label  hard.label

References


Examples

fuzzy.GG(iris[,1:4],K=2,m=2,max.iteration=20,threshold=1e-3,RandomNumber=1234)

<table>
<thead>
<tr>
<th>fuzzy.GK</th>
<th>Gustafson Kessel Clustering with Babuska Improvisation</th>
</tr>
</thead>
</table>

Description

Gustafson Kessel clustering Algorithm that improved by Babuska for estimating covariance cluster (Babuska, 2002)

Usage

fuzzy.GK(X, K, m, gamma, rho, max.iteration, threshold, member.init, RandomNumber = 0, print.result = 0)

Arguments

X  dataset (matrix/data frame)
K  number of cluster
m  fuzzyfier
gamma  tuning parameter
rho  volume cluster parameter
max.iteration  maximum iteration for convergence
threshold  convergence criteria
member.init  membership object or matrix that will be used for initialized
RandomNumber  random number for start initializing
print.result  print result (0/1)
Details

This function performs the Gustafson Kessel algorithm by Gustafson and Kessel (1968) improved by Babuska et al. (2002). Gustafson Kessel (GK) is one of the fuzzy clustering methods for clustering datasets into K clusters. The number of clusters (K) must be greater than 1. To control the overlapping or fuzziness of clustering, the parameter m must be specified. Maximum iteration and threshold are specific numbers for converging the cluster. Random Number is a number that will be used for seeding to initially generate the fuzzy membership matrix.

Clustering will produce a fuzzy membership matrix (U) and fuzzy cluster centroid (V). The greatest value of membership on data points will determine the cluster label. The centroid or cluster center can be used to interpret the cluster. Both membership and centroids are produced by calculating mathematical distances. Gustafson Kessel calculates distance using the Covariance Cluster norm distance. So it can be said that clusters will have both spherical and ellipsoidal shapes of geometry.

Babuska improves the covariance estimation via tuning covariance with the covariance of data. Tuning parameters determine the proportion of covariance data and covariance cluster that will be used to estimate new covariance clusters. Besides improving via tuning, Babuska improves the algorithm with decomposition of covariance so it will become non-singular.

Value

Fuzzy Clustering object

Slots

- centroid: centroid matrix
- distance: distance matrix
- func.obj: function objective
- call.func: called function
- fuzzyfier: fuzzyness parameter
- method.fuzzy: method of fuzzy clustering used
- member: membership matrix
- hard.label: hard label

References


Examples

fuzzy.GK(iris[,1:4],K=2,m=2,max.iteration=20,threshold=1e-3,RandomNumber=1234)
**fuzzycluster-class**  

**Description**  

Fuzzy Result  

**Slots**  

- centroid  
- distance  
- func.obj  
- call.func  
- fuzzyfier  
- method.fuzzy  
- member  
- hard.label  

---

**fuzzycluster_list-class**  

**Description**  

Fuzzy Result List  

**Slots**  

- pair  

list of fuzzy cluster object
is.na, co_fuzzycluster-method

**is.na**

*Check membership Matrix/Object*

**Description**

checking object is membership object or not

**Usage**

```r
is.namembership(object)
```

**Arguments**

- `object` an object that used for membership checking

**Value**

T/F

---

**is.na, co_fuzzycluster-method**

*Method for co_fuzzycluster classes*

**Description**

Method for co_fuzzycluster classes

**Usage**

```r
## S4 method for signature 'co_fuzzycluster'
is.na(x)

## S4 method for signature 'co_fuzzycluster'
show(object)

method.consensus(x)

## S4 method for signature 'co_fuzzycluster'
method.consensus(x)
```

**Arguments**

- `x` an co_fuzzycluster object
- `object` an co_fuzzycluster object
is.na.fuzzycluster-method

Method for fuzzycluster classes

Description

Method for fuzzycluster classes

Usage

```r
# S4 method for signature 'fuzzycluster'
is.na(x)

# S4 method for signature 'fuzzycluster'
show(object)

centroid(x)

# S4 method for signature 'fuzzycluster'
centroid(x)

distance(x)

# S4 method for signature 'fuzzycluster'
distance(x)

func.obj(x)

# S4 method for signature 'fuzzycluster'
func.obj(x)

call.func(x)

# S4 method for signature 'fuzzycluster'
call.func(x)

fuzzyfier(x)

# S4 method for signature 'fuzzycluster'
fuzzyfier(x)

method.fuzzy(x)

# S4 method for signature 'fuzzycluster'
method.fuzzy(x)

.cPair(x, y)
```
## is.na, membership-method

### Method for membership classes

#### Arguments

- **x**: an `fuzzycluster` object
- **y**: an `fuzzycluster` object

#### Description

Method for membership classes

#### Usage

```r
## S4 method for signature 'membership'
is.na(x)

## S4 method for signature 'membership'
show(object)

## S4 method for signature 'membership'
mem(x)

## S4 method for signature 'membership'
hard.label(x)
```
**membership**

**Arguments**

- `x` an object
- `object` an object

**Description**

Make an Partition Matrix

**Usage**

```r
membership(member, K, n, RandomNumber = 0)
```

**Arguments**

- `member` membership matrix
- `K` number of cluster
- `n` number of observation
- `RandomNumber` random number/seed used

**Value**

membership object

**Slots**

- `member` membership object
- `hard.label` hard label

**Examples**

```r
# make an matrix membership
membership(K=3,n=20,RandomNumber=1234)
```

**membership-class**

**Description**

Membership

**Slots**

- `member` membership matrix
- `hard.label` vector of hard labeling
minWeightBipartiteMatching

*Matching label*

---

**Description**

Matching label of 2 cluster via Hungary Algorithm

**Usage**

minWeightBipartiteMatching(x, y)

**Arguments**

- **x**
  - an fuzzycluster object
- **y**
  - an fuzzy cluster object

---

pair  

*Method for fuzzycluster_list classes*

---

**Description**

Method for fuzzycluster_list classes

**Usage**

pair(object)

```r
## S4 method for signature 'fuzzycluster_list'
pair(object)
```

**Arguments**

- **object**
  - an fuzzycluster_list object
print.co_fuzzycluster

Print Consensus Fuzzy Clustering Result

Description

Print Consensus Fuzzy Clustering

Usage

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

Arguments

x  consensus fuzzy clustering object
...
another parameter

print.fuzzycluster

Print Fuzzy Clustering Result

Description

Print Fuzzy Clustering

Usage

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

Arguments

x  fuzzy clustering object
...
another parameter
print.membership  

**Description**

Print membership object

**Usage**

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

**Arguments**

- `x`: membership object
- `...`: another parameter

print.validation  

**Description**

Print Validation Index for fuzzy clustering

**Usage**

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

**Arguments**

- `x`: validation object
- `...`: another parameter
Radar Plotting Fuzzy Cluster Result

Description

Radar Plotting Fuzzy Cluster Result

Usage

radar.plotting(object, data.X)

Arguments

object  
a fuzzycluster object
data.X  
a matrix data

Details

Make Visualization Radar Ploting

Examples

fuzzy.CM(iris[,1:4],K=3,m=2,max.iteration=100,threshold=1e-5,RandomNumber=1234)->cl
radar.plotting(cl,iris[,1:4])

Method for validation classes

Description

Method for validation classes

Usage

## S4 method for signature 'validation'
show(object)

PC(x)

## S4 method for signature 'validation'
PC(x)

MPC(x)

## S4 method for signature 'validation'
MPC(x)
CE(x)

## S4 method for signature 'validation'
CE(x)

XB(x)

## S4 method for signature 'validation'
XB(x)

S(x)

## S4 method for signature 'validation'
S(x)

Tang(x)

## S4 method for signature 'validation'
Tang(x)

Kwon(x)

## S4 method for signature 'validation'
Kwon(x)

**Arguments**

object an object
x an object

---

validation-class Validation Class

**Description**

Validation Class

**Slots**

- PC Partition Coefficient index
- MPC Modified Partition Coefficient index
- CE Classification Entropy index
- S Separation index
- XB Xie Beni index
validation.index

Kwon  Kwon index
Tang  Tang index

validation.index  Validation Index

Description
Validation index for validating fuzzy clustering result

Usage
validation.index(object)

Arguments
object  fuzzy clustering object

Details
This function provides several validation indexes that are calculated from fuzzy clustering results. Validation index can be used to choose the best optimum parameter.
There are PC, MPC, CE, S, Xie Beni, Kwon, and Tang indices. PC (Partition Coefficient), MPC (Modified Partition Coefficient), and CE (Classification Entropy) are calculated from the membership matrix. S (Separation Index), Xie Beni, Kwon, and Tang use both distance and membership matrix.
The best cluster result can be decided with a minimum value of the index, except MPC and PC use a maximum value.

Value
validation index object.

Slots

X  B  Xie Beni Index
PC  Partition Coefficient
MPC  Modified Partition Coefficient
Kwon  Kwon Index
Tang  Tang Index
S  Separation Index
CE  Classification Entropy

Author(s)
Achmad Fauzi Bagus F
References

Examples
fuzzy.CM(iris[,1:4],K=3,m=2,max.iteration=100,threshold=1e-5,RandomNumber=1234)->cl
validation.index(cl)->valid
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XB(valid)
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