Package 'RMCDA'

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Title Multi-Criteria Decision Analysis in R

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Description This package provides different methods of multi-criteria decision analysis.

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Imports dplyr,
stats,
igraph,
fmsb,
lpSolve

R topics documented:

apply.AHP *Apply AHP on the matrices*

Description

Apply AHP on the matrices

Usage

```
apply.AHP(A, comparing.competitors)
```

Arguments

A	the matrix containing information related to pairwise comparisons of criteria
comparing.competitors	the list of matrices related to pairwise comparisons of competitors for each criteria

Value

a list containing I. The weight of each criteria II. The criteria alternative unweighted matrix III. The weighted scores matrix IV. Competitor final scores

Examples

```
data <- read.csv(system.file("extdata", "AHP_input_file.csv", package = "RMCDA"), header=FALSE)
mat.lst <- read.csv.AHP.matrices(data)
mat.lst[[1]]->A
mat.lst[[2]]->comparing.competitors
results<- apply.AHP(A, comparing.competitors)
```

apply.ANP *Apply Analytical Network Process (ANP) on data*

Description

Apply Analytical Network Process (ANP) on data

Usage

```
apply.ANP(A, comparing.competitors, power)
```

Arguments

A	the matrix containing information related to pairwise comparisons of criteria
comparing.competitors	the list of matrices related to pairwise comparisons of competitors for each criteria
power	the power value of the supermatrix

Value

the limiting super matrix

Examples

```
data <- read.csv(system.file("extdata", "AHP_input_file.csv", package = "RMCDA"), header=FALSE)
mat.lst <- read.csv.AHP.matrices(data)
mat.lst[[1]]->A
mat.lst[[2]]->comparing.competitors
apply.ANP(A, comparing.competitors, 2)
```

---

apply.BWM *Function for applying the Best-Worst Method*

Description

Function for applying the Best-Worst Method

Usage

```
apply.BWM(
  criteria.lst,
  worst.criteria,
  best.criteria,
  best.criteria.preference,
  worst.criteria.preference
)
```

Arguments

`criteria.lst`	list of criteria
`worst.criteria`	the worst criteria
`best.criteria`	the best criteria
`best.criteria.preference`	the comparison of the best criteria to others
`worst.criteria.preference`	the comparison of the worst criteria to others

Value

the result of BWM

apply.CRITIC *Apply CRITIC on comparison matrix*

Description

Apply CRITIC on comparison matrix

Usage

```
apply.CRITIC(A)
```

Arguments

A	the matrix A with row names corresponding to alternatives and column names corresponding to criteria

Value

the weight percentages related to matrix A obtained through the CRITIC method

Examples

```
A <- matrix(c(250, 200, 300, 275, 225, 16, 16, 32, 32, 16, 12, 8, 16, 8, 16, 5, 3, 4, 4, 2), nrow=5, ncol=4)
colnames(A)<-c("Price", "Storage space", "Camera", "Looks")
rownames(A)<-paste0("Mobile ", seq(1, 5, 1))
A[,"Price"] <- -A[,"Price"]
apply.CRITIC(A)
```

apply.FAHP *Apply fuzzy AHP on criteria comparison matrix*

Description

Apply fuzzy AHP on criteria comparison matrix

Usage

```
apply.FAHP(A)
```

Arguments

A	the comparison matrix

Value

the fuzzy weights for each criteria

Examples

```
# example code
data <- read.csv(system.file("extdata", "AHP_input_file.csv", package = "RMCDA"), header=FALSE)
mat.lst <- read.csv.AHP.matrices(data)
mat.lst[[1]]->A
result <- apply.FAHP(A)
```

---

apply.PROMOTHEE *Function for applying PROMOTHEE I or II*

Description

Function for applying PROMOTHEE I or II

Usage

```
apply.PROMOTHEE(A, weights, type = "II")
```

Arguments

A	the comparison matrix with the row names indicating the alternatives and colnames indicating the criteria.
weights	the weights of criteria.

Value

the results of PROMOTHEE

Examples

```
A <- matrix(c(250, 200, 300, 275, 16, 16, 32, 32, 12, 8, 16, 8, 5, 3, 4, 2), nrow=4)
rownames(A)<-c("Mobile 1", "Mobile 2", "Mobile 3", "Mobile 4")
colnames(A)<-c("Price", "Memory", "Camera", "Looks")
weights <- c(0.35, 0.25, 0.25, 0.15)
apply.PROMOTHEE(A, weights)
```

---

apply.SBWM *Function for applying the Stratified Best-Worst Method (SBWM)*

Description

Function for applying the Stratified Best-Worst Method (SBWM)

Usage

```
apply.SBWM(
  comparison.mat,
  others.to.worst,
  others.to.best,
  state.worst.lst,
  state.best.lst,
  likelihood.vector
)
```

Arguments

comparison.mat	the comparison matrix containing the alternatives as column names and the criteria as row names.
others.to.worst	the comparison of the criteria to the worst criteria for each state, column names should be states and the row names are criteria
others.to.best	the comparison of the criteria to the best criteria for each state, column names should be states and the row names are criteria
state.worst.lst	the vector containing the name of the worst criteria in each state
state.best.lst	the vector containing the name of the best criteria in each state
likelihood.vector	the vector containing the likelihood of being in each state.

Value

the result of SBWM

Examples

```
data <- read.csv(system.file("extdata", "stratified_BWM_case_study_I_example.csv", package = "RMCDA"), header
mat.lst <- read.csv.SBWM.matrices(data)
comparison.mat <- mat.lst[[1]]
others.to.worst <- mat.lst[[2]]
others.to.best <- mat.lst[[3]]
state.worst.lst <- mat.lst[[4]]
state.best.lst <- mat.lst[[5]]
likelihood.vector <- mat.lst[[6]]
apply.SBWM(comparison.mat, others.to.worst, others.to.best, state.worst.lst, state.best.lst, likelihood.vect
```

---

apply.SMCDM *Apply stratified multi-criteria decision making method*

Description

Apply stratified multi-criteria decision making method

Usage

```
apply.SMCDM(comparison.mat, state.criteria.probs, likelihood.vector)
```

Arguments

comparison.mat	the matrix containing alternatives as row names and criteria as column names and corresponding scores as cell values.
state.criteria.probs	the matrix containing the states as column names and criteria as row names and the corresponding scores as matrix values.
likelihood.vector	the vector containing the likelihood of being in each state.

Value

the SMCDM results

Examples

```
data <- read.csv(system.file("extdata", "SMCDM_input.csv", package = "RMCDA"), header=FALSE)
mat.lst <- read.csv.SMCDM.matrices(data)
comparison.mat <- mat.lst[[1]]
state.criteria.probs <- mat.lst[[2]]
likelihood.vector <- mat.lst[[3]]
apply.SMCDM(comparison.mat, state.criteria.probs, likelihood.vector)
```

---

apply.TOPSIS *Apply TOPSIS on matrix A with weight of criteria stored in vector w*

Description

Apply TOPSIS on matrix A with weight of criteria stored in vector w

Usage

```
apply.TOPSIS(A, w)
```

Arguments

A	the matrix A with row names corresponding to alternatives and column names corresponding to criteria
w	the weight vector corresponding to the weight of each criteria

Value

performance scores obtained through TOPSIS

Examples

```
A <- matrix(c(250, 200, 300, 275, 225, 16, 16, 32, 32, 16, 12, 8, 16, 8, 16, 5, 3, 4, 4, 2), nrow=5, ncol=4)
colnames(A)<-c("Price", "Storage space", "Camera", "Looks")
rownames(A)<-paste0("Mobile ", seq(1, 5, 1))
A[,"Price"] <- -A[,"Price"]
apply.TOPSIS(A, c(1/4, 1/4, 1/4, 1/4))
```

apply.VIKOR *Function for applying VIKOR to data*

Description

Function for applying VIKOR to data

Usage

```
apply.VIKOR(A, weights, nu = 0.5)
```

Arguments

A	the comparison matrix
weights	the weights of criteria
nu	weight of the maximum utility strategy - set by default to 0.5

find.entropy *Find entropy of each criteria*

Description

Find entropy of each criteria

Usage

```
find.entropy(A)
```

Arguments

A	the matrix A with row names corresponding to alternatives and column names corresponding to criteria

Value

the entropy value corresponding to each criteria

Examples

```
A <- matrix(c(250, 200, 300, 275, 225, 16, 16, 32, 32, 16, 12, 8, 16, 8, 16, 5, 3, 4, 4, 2), nrow=5, ncol=4)
colnames(A)<-c("Price", "Storage space", "Camera", "Looks")
rownames(A)<-paste0("Mobile ", seq(1, 5, 1))
A[,"Price"] <- -A[,"Price"]
find.entropy (A)
```

`find.weight` *Finding the weights for each criteria given a pairwise comparison matrix A in the AHP method*

Description

Finding the weights for each criteria given a pairwise comparison matrix A in the AHP method

Usage

```
find.weight(A)
```

Arguments

`A`	the matrix containing information related to pairwise comparisons of criteria

Value

a list containing the value of CI/RI and a vector containing the weights of each criteria

`plot.AHP.decision.tree` *Plot decision tree*

Description

Plot decision tree

Usage

```
## S3 method for class 'AHP.decision.tree'
plot(A, comparing.competitors)
```

Arguments

`A`	the comparison matrix
`comparing.competitors`	the list of matrices related to pairwise comparisons of competitors for each criteria

Value

the decision tree plot

plot.spider *Plot spider plot*

Description

Plot spider plot

Usage

```
## S3 method for class 'spider'
plot(data, colors = palette("default"))
```

Arguments

data	the result of MCDA scores
colors	the color scheme of choice

Value

the spider plot

read.csv.AHP.matrices *Read csv file containing pairwise comparison matrices for applying AHP or ANP*

Description

Read csv file containing pairwise comparison matrices for applying AHP or ANP

Usage

```
read.csv.AHP.matrices(data)
```

Arguments

data	the matrix containing information related to pairwise comparisons of criteria

Value

a list containing a matrix A related to pairwise comparison of criteria and a list containing multiple matrices related to pairwise comparisons of different competitor products

Examples

```
data <- read.csv(system.file("extdata", "AHP_input_file.csv", package = "RMCDA"), header=FALSE)
mat.lst <- read.csv.AHP.matrices(data)
```

read.csv.SBWM.matrices

Read csv file containing input to the stratified BWM method

Description

Read csv file containing input to the stratified BWM method

Usage

```
read.csv.SBWM.matrices(data)
```

Arguments

data	input of the csv file

Value

the inputs to the SBWM method

Examples

```
data <- read.csv(system.file("extdata", "stratified_BWM_case_study_I_example.csv", package = "RMCDA"), header
mat.lst <- read.csv.SBWM.matrices(data)
```

read.csv.SMCDM.matrices

Read csv file containing pairwise comparison matrices for applying SMCDM

Description

Read csv file containing pairwise comparison matrices for applying SMCDM

Usage

```
read.csv.SMCDM.matrices(data)
```

Arguments

data	the matrix containing information related to pairwise comparisons of criteria

Value

a list containing a matrix A related to pairwise comparison of criteria and a list containing multiple matrices related to pairwise comparisons of different competitor products

Examples

```
data <- read.csv(system.file("extdata", "SMCDM_input.csv", package = "RMCDA"), header = FALSE)
mat.lst <- read.csv.SMCDM.matrices(data)
```

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