Package 'PROMETHEE'

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Type Package

Title Preference Ranking Organization METHod for Enrichment of Evaluations

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Description
Functions which can be used to support the Multicriteria Decision Analysis (MCDA) process involving multiple criteria, by PROMETHEE (Preference Ranking Organization METHod for Enrichment of Evaluations).

License GPL-3

Suggests R.rsp

VignetteBuilder R.rsp

Imports lpSolve

NeedsCompilation no

Repository CRAN

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Contents

Austria

Emissions in Austria in 10 air pollutants divided by the ratio between the gross value added of manufacturing and the gross value-added sourced from all economic activities (years 2008-2015)

Description

The dataset is provided by the AEA accounts (Air Emissions Account) collected yearly by EUROSTAT for the seven-year period 2008-2015. AEA accounts report emissions assigned to the country according to the residence principle (i.e. the residence of the operator causing the emission). The list of pollutants included in the analysis embraces 10 air pollutants that are particularly harmful for human health and environmental balance when highly concentrated in the atmosphere (see Caravaggio et al. 2019)

Usage

```
data(Austria)
```

Details

Caravaggio, N., Caravella, S., Ishizaka, A., & Resce, G. (2019). Beyond CO2: a multi-criteria analysis of air pollution in Europe. Journal of Cleaner Production.

Author(s)

Nicola Caravaggio, Serenella Caravella, Alessio Ishizaka, Giuliano Resce, Francesco Vidoli

References

https://doi.org/10.1016/j.jclepro.2019.02.115

Examples

```
data(Austria)
```

PROMETHEE

Preference Ranking Organization METHod for Enrichment of Evaluations

Description

Functions which can be used to support the Multicriteria Decision Analysis (MCDA) process involving multiple criteria, by PROMETHEE (Preference Ranking Organization METHod for Enrichment of Evaluation)

Usage

```
PROMETHEE(dataset, PreferenceF,PreferenceT,IndifferenceT,Weights,Min_Max,S_Gauss)
```

Arguments

dataset	A matrix with data (alternatives by row and criteria by column)
PreferenceF	A matrix with preference functions (alternatives by row and criteria by column)
PreferenceT	A matrix with preference thresholds (alternatives by row and criteria by column)
IndifferenceT	A matrix with indifference thresholds (alternatives by row and criteria by column)
Weights	A matrix with weights (alternatives by row and criteria by column)
Min_Max	A matrix that specifies whether the criteratum should be maximized or minimized (alternatives by row and criteria by column)
S_Gauss	A matrix with S Gaussians (alternatives by row and criteria by column)

Details

Thanks are extended to Salvatore Greco, Alessio Ishizaka, and Gianpiero Torrisi for helpful comments

Value

Outranking	Outranking matrix (alternatives by row and criteria by column)
Nonoutranking	Non-outranking matrix (alternatives by row and criteria by column)
UnicriterionNetFlows	Unicriterion net flows matrix (alternatives by row and criteria by column)
PROMETHEE1	PROMETHEE I matrix (first column is Positive Flows and second column is Negative Flows, alternatives by row)
PROMETHEE2	PROMETHEE II vector (Global net Flows, alternatives by row)

Author(s)

Giuliano Resce, Menelaos Tasiou, Francesco Vidoli

Examples

```
# Dataset
dati<-as.data.frame(cbind(c(10,25,4,2),
                          c(250000,270000,320000,350000),
                          c(3,4,2,2),
                          c(20,10,15,7)))

colnames(dati) = c("Distance.to.work","Price","Bedrooms","Age")


# PreferenceF
```

```
PreF<-as.data.frame(rbind(c("Gaussian","Linear","V-shape","Level"),
                    c("Gaussian","Linear","V-shape","Level"),
                    c("Gaussian","Linear","V-shape","Level"),
                    c("Gaussian","Linear","V-shape","Level")))
colnames(PreF) = c("Distance.to.work","Price","Bedrooms","Age")


# PreferenceT
PreT<-as.data.frame(cbind(c(2,2,2,2),
                          c(50000,50000,50000,50000),
                          c(2,2,2,2),
                          c(5,5,5,5)))
colnames(PreT) = c("Distance.to.work","Price","Bedrooms","Age")


# IndifferenceT
IndT<-as.data.frame(cbind(c(1,1,1,1),
                          c(10000,10000,10000,10000),
                          c(0,0,0,0),
                          c(2,2,2,2)))
colnames(IndT) = c("Distance.to.work","Price","Bedrooms","Age")


#Weights
Weig<-as.data.frame(cbind(c(0.25,0.25,0.25,0.25),
                          c(0.25,0.25,0.25,0.25),
                          c(0.25,0.25,0.25,0.25),
                          c(0.25,0.25,0.25,0.25)))
colnames(Weig) = c("Distance.to.work","Price","Bedrooms","Age")


# Min_Max
MiMa<-as.data.frame(cbind(c("min","min","min","min"),
                          c("min","min","min","min"),
                          c("max","max","max","max"),
                          c("min","min","min","min")))
colnames(MiMa) = c("Distance.to.work","Price","Bedrooms","Age")


#S_Gauss
gauss<-as.data.frame(cbind(c(2,2,2,2),
                          c(0,0,0,0),
                          c(0,0,0,0),
                          c(0,0,0,0)))
colnames(gauss) = c("Distance.to.work","Price","Bedrooms","Age")


################################

PF = PROMETHEE(dati, PreF,PreT,IndT,Weig,MiMa,gauss)

################################
```

```
PCA_UNIC <- prcomp(PF$UnicriterionNetFlows,center = TRUE,scale. = TRUE)
GAIA=predict(PCA_UNIC)[,1:2]
rownames(GAIA)=rownames(dati)
print(GAIA)
```

PROMETHEE_OW *Preference Ranking Organization METHod for the Enrichment of Evaluations with Optimal Weights*

Description

Functions which can be used to support the Multicriteria Decision Analysis (MCDA) process involving multiple criteria, by a specific tool allowing joining the consolidated procedure usually employed for environmental evaluation (PROMETHEE), with a more flexible weighing process inspired by DEA

Usage

```
PROMETHEE_OW(dataset,PreferenceF,PreferenceT,IndifferenceT,Weights,Min_Max,S_Gauss,dir)
```

Arguments

dataset	A matrix with data (alternatives by row and criteria by column)
PreferenceF	A matrix with preference functions (alternatives by row and criteria by column)
PreferenceT	A matrix with preference thresholds (alternatives by row and criteria by column)
IndifferenceT	A matrix with indifference thresholds (alternatives by row and criteria by column)
Weights	A matrix with weights (alternatives by row and criteria by column)
Min_Max	A matrix that specifies whether the criteratum should be maximized or minimized (alternatives by row and criteria by column)
S_Gauss	A matrix with S Gaussians (alternatives by row and criteria by column)
dir	An element specifying whether the optimization should be "Optimistic" or "Pessimistic"

Details

Caravaggio, N., Caravella, S., Ishizaka, A., & Resce, G. (2019). Beyond CO2: a multi-criteria analysis of air pollution in Europe. Journal of Cleaner Production.

Value

Outranking	Outranking matrix (alternatives by row and criteria by column)
Nonoutranking	Non-outranking matrix (alternatives by row and criteria by column)
UnicriterionNetFlows	Unicriterion net flows matrix (alternatives by row and criteria by column)
Res	DEA weights and global score

Author(s)

Giuliano Resce, Menelaos Tasiou, Francesco Vidoli

Examples

```
data(Austria)

PreferenceF= matrix("Level",nrow(Austria),ncol(Austria) )
PreferenceT=matrix(0,nrow(Austria),ncol(Austria) )
IndifferenceT=matrix(0,nrow(Austria),ncol(Austria) )
Weights=matrix(1,nrow(Austria),ncol(Austria) )
Min_Max=matrix("min",nrow(Austria),ncol(Austria) )
S_Gauss=matrix(0,nrow(Austria),ncol(Austria) )

PF=PROMETHEE_OW(Austria, PreferenceF,PreferenceT,IndifferenceT,Weights,Min_Max,S_Gauss,
                "Optimistic")
PF$Res
PF=PROMETHEE_OW(Austria, PreferenceF,PreferenceT,IndifferenceT,Weights,Min_Max,S_Gauss,
                "Pessimistic")
PF$Res
```

Index