Package: rMOST (via r-universe)

Title Estimates Pareto-Optimal Solution for Hiring with 3 Objectives

Version 1.0.1

Description Estimates Pareto-optimal solution for personnel selection
with 3 objectives using Normal Boundary Intersection (NBI)
algorithm introduced by Das and Dennis (1998)
<doi:10.1137/S1052623496307510>. Takes predictor
intercorrelations and predictor-objective relations as input
and generates a series of solutions containing predictor
weights as output. Accepts between 3 and 10 selection
predictors. Maximum 2 objectives could be adverse impact
objectives. Partially modeled after De Corte (2006) TROFSS
Fortran program <https://users.ugent.be/~wdecorte/trofss.pdf>
and updated from 'ParetoR' package described in Song et al.
(2017) <doi:10.1037/apl0000240>. For details, see Study 3 of
Zhang et al. (2023).

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Encoding UTF-8

RoxygenNote 7.2.1

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

Imports graphics, grDevices, nloptr, stats

Config/testthat/edition 3

NeedsCompilation no

Author Chelsea Song [aut, cre]
(<https://orcid.org/0000-0003-0910-1281>), Yesuel Kim [ctb]
(<https://orcid.org/0000-0002-8486-7693>)

Maintainer Chelsea Song <qianqisong@gmail.com>

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Repository https://diversity-paretooptimal.r-universe.dev

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Contents

MOST　　　　　　　　　　　*MOST*

Description

Optimizes 3 objectives with normal boundary intersection algorithm

Usage

```
MOST(optProb, Rx, Rxy1, Rxy2, Rxy3, sr, prop1, prop2, d1, d2, Spac = 10)
```

Arguments

optProb	Optimization problem. "3C" = no adverse impact objectives and three non-adverse impact objectives; "2C_1AI" = one adverse impact objective and two non-adverse impact objectives; "1C_2AI" = two adverse impact objectives and one non-adverse impact objective.
Rx	Predictor intercorrelation matrix
Rxy1	Needs to specify for all three types of optimization problems (optProb). Predictor criterion-related validity for non-adverse impact objective 1 (i.e., correlation between each predictor and non-adverse impact objective 1)
Rxy2	Only specify if optimization problem is "3C" or "2C_1AI". Predictor criterion-related validity for non-adverse impact objective 2 (i.e., correlation between each predictor and non-adverse impact objective 2)
Rxy3	Only specify if optimization problem is "3C". Predictor criterion-related validity for non-adverse impact objective 3 (i.e., correlation between each predictor and non-adverse impact objective 3)
sr	Only specify if optimization problem is "2C_1AI" or "1C_2AI". Overall selection ratio.
prop1	Only specify if optimization problem is "2C_1AI" or "1C_2AI". Proportion of minority1 in the applicant pool; prop1 = (# of minority1 applicants)/(total # of applicants)
prop2	Only specify if optimization problem is "1C_2AI". Proportion of minority2 in the applicant pool; prop2 = (# of minority2 applicants)/(total # of applicants)
d1	Only specify if optimization problem is "2C_1AI" or "1C_2AI". Vector of standardized group-mean differences between majority and minority 1 for each predictor; d1 = avg_majority - avg_minority1

d2   Only specify if optimization problem is "1C_2AI". Vector of standardized group-mean differences between majority and minority 2 for each predictor; d2 = avg_majority - avg_minority2

Spac   Determines the number of solutions.

Details

Inputs required by optimization problems Different types of optimization problems require different input parameters: * optProb = "3C": MOST(optProb, Rx, Rxy1, Rxy2, Rxy3) * optProb = "2C_1AI": MOST(optProb, Rx, Rxy1, Rxy2, sr, prop1, d1) * optProb = "1C_2AI": MOST(optProb, Rx, Rxy1, sr, prop1, d1, prop2, d2)

Notes regarding the inputs * For personnel selection applications, all predictor-intercorrelations and criterion-related validity inputs should be corrected for range restriction and criterion unreliability to reflect the relations in the applicant sample. * For optimization problems with 2 adverse impact objectives (i.e., optProb = "1C_2AI"), d1 and d2 should be the standardized mean difference between a minority group and the same reference group (e.g., Black-White and Hispanic-White, not Black-White and female-male)

Optimization * Optimization may take several minutes to run. * Optimization may fail in some applications due to non-convergence.

For more details, please consult the vignette.

Value

Pareto-Optimal solutions with objective values (e.g., C1, AI1) and the corresponding predictor weights (e.g., P1, P2)

Examples

```
# A sample optimization problem with 3 non-adverse impact objectives and 3 predictors
# For more examples, please consult the vignette.

# Specify inputs
# Predictor inter-correlation matrix (Rx)
Rx <- matrix(c(1,   .50, .50,
               .50,  1, .50,
               .50, .50,  1), 3, 3)

# Predictor-objective relation vectors (Rxy1, Rxy2, Rxy3)
# Criterion-related validities
## Criterion 1
Rxy1 <- c(-.30, 0, .30)
## Criterion 2
Rxy2 <- c(0, .30, -.30)
## Criterion 3
Rxy3 <- c(.30, -.30, 0)

# Get Pareto-optimal solutions

out <- MOST(optProb = "3C", Rx = Rx, Rxy1 = Rxy1, Rxy2 = Rxy2, Rxy3 = Rxy3, Spac = 10)
out
```

ParetoR_1C_2AIR   *ParetoR_1C_2AIR*

Description

Command function to optimize 1 non-adverse impact objective and 2 adverse impact objectives via NBI algorithm

Usage

```
ParetoR_1C_2AIR(sr, prop1, prop2, Rx, Rxy1, d1, d2, Spac = 10)
```

Arguments

sr	Selection ratio in the full applicant pool
prop1	Proportion of minority1 applicants in the full applicant pool
prop2	Proportion of minority2 applicants in the full applicant pool
Rx	Matrix with intercorrelations among predictors
Rxy1	Vector with correlation between each predictor and the non-adverse impact objective
d1	Subgroup difference 1; standardized mean differences between minority1 and majority subgroups on each predictor in full applicant pool
d2	Subgroup difference 2; standardized mean differences between minority2 and majority subgroups on each predictor in full applicant pool
Spac	Number of solutions

Value

out Pareto-Optimal solution with objective outcome values (Criterion) and predictor weights (ParetoWeights)

ParetoR_2C   *ParetoR_2C*

Description

Command function to optimize 2 non-adverse impact objectives via NBI algorithm

Usage

```
ParetoR_2C(Rx, Rxy1, Rxy2, Spac = 10, graph = TRUE)
```

Arguments

Rx	Matrix with intercorrelations among predictors
Rxy1	Vector with correlation between each predictor and non-adverse impact objective 1
Rxy2	Vector with correlation between each predictor and non-adverse impact objective 2
Spac	Number of Pareto points
graph	If TRUE, plots will be generated for Pareto-optimal curve and predictor weights

Value

out Pareto-Optimal solution with objective outcome values (Criterion) and predictor weights (ParetoWeights)

ParetoR_2C_1AIR   *ParetoR_2C_1AIR*

Description

Command function to optimize 2 non-adverse impact objectives and 1 adverse impact objective via NBI algorithm

Usage

```
ParetoR_2C_1AIR(Rx, Rxy1, Rxy2, sr, prop1, d1, Spac = 10)
```

Arguments

Rx	Matrix with intercorrelations among predictors
Rxy1	Vector with correlation between each predictor and non-adverse impact objective 1
Rxy2	Vector with correlation between each predictor and non-adverse impact objective 2
sr	Selection ratio in full applicant pool
prop1	Proportion of minority applicants in full applicant pool
d1	Subgroup difference; standardized mean differences between minority and majority subgroups on each predictor in full applicant pool
Spac	Number of Pareto points

Value

out Pareto-Optimal solution with objective outcome values (Criterion) and predictor weights (ParetoWeights)

ParetoR_3C	*ParetoR_3C*

Description

Command function to optimize 3 non-adverse impact objectives via NBI algorithm

Usage

```
ParetoR_3C(Rx, Rxy1, Rxy2, Rxy3, Spac = 10)
```

Arguments

Rx	Matrix with intercorrelations among predictors
Rxy1	Vector with correlation between each predictor and non-adverse impact objective 1
Rxy2	Vector with correlation between each predictor and non-adverse impact objective 2
Rxy3	Vector with correlation between each predictor and non-adverse impact objective 3
Spac	Number of solutions

Value

out Pareto-Optimal solution with objective outcome values (Criterion) and predictor weights (ParetoWeights)

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