Package 'eti'

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Title Estimating Targeted Interventions

Version 1.0

Description Package for evaluating the impact of targeted interventions using targeted minimum loss-based estimation

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Depends data.table, SuperLearner

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`idie_exposed` *Targeted minimum-loss based estimator for the Interventional Disparity Indirect Effect (IDIE) among the exposed*

Description

The `idie_exposed` is a Targeted Minumum-loss based estimator (TMLE) for the Interventional Disparity Indirect Effect (IDIE) among the exposed. We consider a structure, where the mediator (Z) is an effect of the exposure (A) and a cause of the outcome (Y), A -> Z -> Y. The function estimates the expected change in outcome risk among the exposed (A=1) if hypothetically the exposed had the same probability of the mediator (Z) as observed for similar unexposed (A=0) individuals. The expected outcome risk under this hypothetical intervention is compared to the outcome risk among the exposed when the distribution of the mediator was set to the observed level among the exposed. Importantly, for this estimator the exposure, mediator, and outcome must all be binary. The underlying model for the exposure, mediator, and outcome, which are needed to estimate any

of the parameters, can be modelled using discrete Super learning. In this case, Super learning is used to select the single best-performing algorithm in the library according to the cross-validated loss-function. One must define a library of candidate algorithms which should be considered by the Super learner. If the Super learner library contains only one algorithm, results will be estimated based on this algorithm alone, and thus, not using Super Learning.

Usage

```
idie_exposed(data, exposure.A=NA, mediator.Z=NA, outcome.Y=NA,
cov.A, cov.Z, cov.Y, SL.lib.A=FALSE, SL.lib.Z=FALSE, SL.lib.Y=FALSE, iterations=10)
```

Arguments

`data`	A data frame/data table with a binary exposure, a binary mediator, a binary outcome, and covariates.
`exposure.A`	Name of the binary exposure.
`mediator.Z`	Name of the binary mediator, which is the target of the hypothetical intervention.
`outcome.Y`	Name of the binary outcome.
`cov.A`	A vector containing names of possible confounders which should be included in models of the exposure.
`cov.Z`	A vector of confounders which should be included in models of the mediator. Do not include the exposure as the function does this.
`cov.Y`	A vector of confounders which should be included in models of the outcome. Do not include the exposure and the mediator as the function does this.
`SL.lib.A`	A vector of algorithms that should be considered by the super learner when modelling the exposure. All algorithms must be specified as Super Learner objects.
`SL.lib.Z`	A vector of algorithms for modelling the mediator. All algorithms must be specified as Super Learner objects.
`SL.lib.Y`	A vector of algorithms for modelling the outcome. All algorithms must be specified as Super Learner objects.
`iterations`	Number of iterations for the updating step in TMLE. Defaults to 10.

Details

The structure of the data should be as follows: For the binary exposure (`exposure.A`) 1 = exposed and 0 = unexposed. For the binary mediator (`mediator.Z`) 1 = treatment and 0 = no treatment. For the binary outcome (`outcome.Y`) 1 = event and 0 = no event.

Value

The function outputs the absolute outcome risk among the exposed had their chance of the mediator been the same as for similar unexposed individuals, the absolute outcome risk among the exposed under no intervention, where the probability of the mediator is as observed (psi1), the absolute risk difference between the two, the interventional disparity indirect effect among the exposed, and standard errors for each estimate.

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Examples

```
library(data.table)
require(tmleExposed)
n=5000
set.seed(1)
sex <- rbinom(n,1,0.4)
age <- rnorm(n,65,sd=5)
disease <- rbinom(n,1,0.6)

A <- rbinom(n, 1, plogis(-3+0.05*age+1*sex))
Z <- rbinom(n, 1, plogis(5-0.08*age+1*sex-1.2*disease-0.8*A+0.01*A*disease))
Y <- rbinom(n, 1, plogis(-9+0.09*age+0.5*sex+0.8*disease-1.2*Z+0.7*A))

d <- data.table(id=1:n, exposure=as.integer(A), mediator=as.integer(Z),
               outcome=as.integer(Y), age, sex, disease)

##### Define algorithms for the Super Learner library #####
lib = c('SL.glm','SL.step.interaction')

#intervention: changing probability of the mediator (Z=1) among the exposed (A=1)
#to what it would have been had they been unexposed (A=0).
#target parameter: the change in outcome among the exposed (A=1) had their chance of
#the mediator (Z=1) been as among similar unexposed individuals (A=0).

res<-idie_exposed(data=d,
                 exposure.A='exposure',
                 mediator.Z='mediator',
                 outcome.Y='outcome',
                 cov.A=c('sex','age'),
                 cov.Z =c('sex','age','disease'),
                 cov.Y=c('sex','age','disease'),
                 SL.lib.A = lib,
                 SL.lib.Z = lib,
                 SL.lib.Y = lib)
summary(res)
```

`print.idie_exposed` *Print function for* `idie_exposed`

Description

Print function for `idie_exposed` a targeted minimum-loss based estimator for the Interventional Disparity Indirect Effect (IDIE) among the exposed.

Usage

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

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summary.idie_exposed *Summary function for* idie_exposed

Description

Summary function for idie_exposed a targeted minimum-loss based estimator for the Interventional Disparity Indirect Effect (IDIE) among the exposed.

Usage

```
## S3 method for class 'idie_exposed'
summary(x, ...)
```

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