Package 'PolyTree'

July 21, 2025

Title Estimate Causal Polytree from Data

Version 0.0.1

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Description Given a data matrix with rows representing data vectors and columns representing variables, produces a directed polytree for the underlying causal structure. Based on the algorithm developed in Chatterjee and Vidyasagar (2022) <doi:10.48550/arXiv.2209.07028>. The method is fully nonparametric, making no use of linearity assumptions, and especially useful when the number of variables is large.

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Encoding UTF-8

RoxygenNote 7.3.1

Imports FOCI, igraph

NeedsCompilation no

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`condeptree` *This is the function that computes the skeletion tree from data. The input is a matrix x whose rows are the data vectors. The sample size n is the number of rows. The number of variables p is the number of columns The function outputs the skeleton tree g.*

Description

This is the function that computes the skeletion tree from data. The input is a matrix x whose rows are the data vectors. The sample size n is the number of rows. The number of variables p is the number of columns The function outputs the skeleton tree g.

Usage

```
condeptree(x)
```

Arguments

`x`	The input data matrix.

`outgoing` *Creates an outgoing tree from a given undirected treee.*

Description

Creates an outgoing tree from a given undirected treee.

Usage

```
outgoing(tree, dir_tree = NULL, a = NULL, b = 1)
```

Arguments

`tree`	Input tree, undirected.
`dir_tree`	Directionalities that must be present.
`a`	The node being inspected.
`b`	The neighbor being inspected.

polytree *Causal Polytree Estimation*

Description

Estimates directed causal polytree from data, using algorithm developed in Chatterjee and Vidyasagar (2022).

Usage

```
polytree(x)
```

Arguments

x	Data matrix, whose rows are i.i.d. data vectors generated from the model.

Value

A directed polytree estimated from the input data, as an igraph object.

References

Sourav Chatterjee and Mathukumalli Vidyasagar (2022). Estimating large causal polytrees from small samples. Available at https://arxiv.org/abs/2209.07028

Examples

```
p <- 10
n <- 200
x <- matrix(nrow = n, ncol = p)
for (i in 1:n) {
   x[i,1] = rnorm(1)
   for (j in 2:p) {
      x[i,j] = (x[i,j-1] + rnorm(1))/sqrt(2)
   }
}
p <- polytree(x)
```

xicorln *This function computes the xi correlation coefficient.*

Description

This function computes the xi correlation coefficient.

Usage

```
xicorln(xvec, yvec)
```

Arguments

xvec	The vector of x values.
yvec	The vector of y values.

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