

Package ‘SEMID’

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Title Identifiability of linear structural equation models

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Description This package provides routines to check identifiability or non-identifiability of linear structural equation models as described in Drton, Foygel & Sullivant (Ann. Statist., 2011) and Foygel, Draisma & Drton (Ann. Statist., 2012). The routines are based on the graphical representation of structural equation models by a path diagram/mixed graph.

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URL <http://www.r-project.org> <http://www.stat.washington.edu/~md5>

NeedsCompilation no

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Description

This function checks global and generic identifiability of linear structural equation models. For generic identifiability the function checks a sufficient criterion as well as a necessary criterion but this check may be inconclusive.

Usage

```
graphID(L,0, output.type = 'matrix', file.name = NULL,
        decomp.if.acyclic = TRUE, test.globalID = TRUE, test.genericID = TRUE,
        test.nonID = TRUE)
```

Arguments

L	Adjacency matrix for the directed part of the path diagram/mixed graph; an edge pointing from i to j is encoded as $L[i,j]=1$.
0	Adjacency matrix for the bidirected part of the path diagram/mixed graph.
output.type	A character string indicating whether output is printed ('matrix'), saved to a file ('file'), or returned as a list ('list') for further processing in R.
file.name	A character string naming the output file.
decomp.if.acyclic	A logical value indicating whether an input graph that is acyclic is to be decomposed before applying identifiability criteria.
test.globalID	A logical value indicating whether or not global identifiability is checked.
test.genericID	A logical value indicating whether or not a sufficient condition for generic identifiability is checked.
test.nonID	A logical value indicating whether or not a condition implying generic non-identifiability is checked.

Value

A list or printed matrix indicating the identifiability status of the linear SEM given by the input graph. Optionally the graph's components are listed.

With `output.type = 'list'`, the function returns a list of components for the graph. Each list entry is again a list that indicates first which nodes form the component and second whether the component forms a mixed graph that is acyclic. The next entries in the list show HTC-identifiable nodes, meaning nodes v for which the coefficients for all the directed edges pointing to v can be identified using the methods from Foygel et al. (2012). The HTC-identifiable nodes are listed in the order in which they are found by the recursive identification algorithm. The last three list entries are logical values that indicate whether or not the graph component is generically identifiable, globally identifiable or not identifiable; compare Drton et al. (2011) and Foygel et al. (2012). In the latter case the Jacobian of the parametrization does not have full rank.

With `output.type = 'matrix'`, a summary of the above information is printed.

References

Drton, M., Foygel, R., and Sullivant, S. (2011) Global identifiability of linear structural equation models. *Ann. Statist.* 39(2): 865-886.

Foygel, R., Draisma, J., and Drton, M. (2012) Half-trek criterion for generic identifiability of linear structural equation models. *Ann. Statist.* 40(3): 1682-1713.

Examples

```
L = t(matrix(
  c(0, 1, 0, 0, 0,
    0, 0, 1, 0, 0,
    0, 0, 0, 1, 0,
    0, 0, 0, 0, 1,
    0, 0, 0, 0, 0), 5, 5))
O = t(matrix(
  c(0, 0, 1, 1, 0,
    0, 0, 0, 1, 1,
    0, 0, 0, 0, 0,
    0, 0, 0, 0, 0,
    0, 0, 0, 0, 0), 5, 5)); O=O+t(O)
graphID(L,O)

## Examples from Foygel, Draisma & Drton (2012)
demo(SEMID)
```

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