Package 'HOasso'

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Type Package

Title Higher Order Assortativity for Complex Networks

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Description Allows to evaluate Higher Order Assortativity of complex networks defined through objects of class 'igraph' from the package of the same name. The package returns a result also for directed and weighted graphs. References, Arcagni, A., Grassi, R., Stefani, S., & Torriero, A. (2017) <doi:10.1016/j.ejor.2017.04.028> Arcagni, A., Grassi, R., Stefani, S., & Torriero, A. (2021) <doi:10.1016/j.jbusres.2019.10.008> Arcagni, A., Cerqueti, R., & Grassi, R. (2023) <doi:10.48550/arXiv.2304.01737>.

Depends igraph, Rdpack

RdMacros Rdpack

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R topics documented:

HOasso   *Evalutes Higer Order Assortativity of complex networks*

Description

The function evalutes Higer Order Assortativity of complex networks represented by objects of class igraph from the package of the same name.

Usage

```
HOasso(
    g,
    h = 1,
    weighted = is.weighted(g),
    x = c("sout", "dout", "lout", "sin", "din", "lin"),
    y = c("sin", "din", "lin", "sout", "dout", "lout")
)

  ## S3 method for class 'assortativity'
plot(x,
    type = "h",
    ylim = c(-1, 1),
    xlab = "Orders",
    ylab = "Assortativity",
    ...
  )

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

Arguments

g	an object of class igraph with two columns, listing the dominances, by rows.
h	an integer value, the function will evaluates the assortativity from the order 1 to the order h.
weighted	logical, if to use the weighted matrix to create the trasnition probabilities.
x	In case of the HOasso function the first centrarlity measure, out-strength by default, see details. An object of class assortativity in case of the print and plot functions
y	The second centrarlity measure, in-strength by default, see details.
type	Type of plot, histogram-like vertical lines by default.
xlab	A label for the x axis, Orders by default.
ylab	A label for the x axis, Assortativity by default.
ylim	The y limits of the plot, the assortativity index can assume only values between -1 and 1.
...	Other arguments of the plot.default or the print.default functions.

Details

Arguments x and y are `character` objects and can assume values `"sout"`, `"dout"`, `"lout"`, `"sin"`, `"din"`, `"lin"` representing the out-strength, out-degree, out-log-strength, in-strength, in-degree, and in-log-strength respectively.

In case of undirected graphs in- and out- centrality measures are equal. In case of unweighted graphs the strength is equal to the degree.

The function returns an object of class `assortativity` subclass of a `numeric` vector.

`plot.assortativity` is identical to `plot.default` but with different defaults in order to get a plot coherent with the assortativity index.

`print.assortativity` is a method to show the assortativity values and the order side by syde.

Value

A vector `h` long containing the assortativity measures from the order 1 to the order `h`.

References

Arcagni A, Grassi R, Stefani S, Torriero A (2017). "Higher order assortativity in complex networks." *European Journal of Operational Research*, **262**(2), 708–719. doi:10.1016/j.ejor.2017.04.028.

Arcagni A, Grassi R, Stefani S, Torriero A (2021). "Extending assortativity: An application to weighted social networks." *Journal of Business Research*, **129**, 774–783. doi:10.1016/j.jbusres.2019.10.008.

Arcagni A, Cerqueti R, Grassi R (2023). "Higher order assortativity for directed weighted networks and Markov chains." *arXiv preprint arXiv:2304.01737*. doi:10.48550/arXiv.2304.01737.

Examples

```
g <- graph_from_data_frame(data.frame(
  from  = c("i", "j", "j", "k", "l"),
  to    = c("k", "k", "l", "l", "i"),
  weight = c( 10,  5,   2,   3,   2 )
))
E(g)$label <- E(g)$weight
a <- HOasso(g, h = 10)
print(a)
plot(a, lwd = 3, panel.first = abline(h = 0, lty = 2))
```

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