Package ‘ergm.rank’

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Title    Fit, Simulate and Diagnose Exponential-Family Models for Rank-Order Relational Data
Depends  R (>= 4.0),
         ergm (>= 4.2.2),
         network (>= 1.15)
Imports  statnet.common (>= 4.2.0),
         utils
LinkingTo ergm
Suggests covr,
         knitr,
         rmarkdown
License   GPL-3 + file LICENSE
URL       https://statnet.org
BugReports https://github.com/statnet/ergm.rank/issues
VignetteBuilder rmarkdown, knitr
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R topics documented:

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ergm.rank-package

**Description**

`ergm.rank` is a set of extensions to package `ergm` to fit and simulate from exponential-family random graph models for networks whose edge weights are ranks. For a list of functions type `help(package='ergm')` and `help(package='ergm.rank')`

**Details**

Mainly, it implements the CompleteOrder reference measure for valued ERGMs (documented here), and provides some rank-order change statistics (documented here).

For a complete list of the functions, use `library(help="ergm")` and `library(help="ergm.rank")` or read the rest of the manual.

When publishing results obtained using this package, please cite the original authors as described in `citation(package="ergm.rank")`.

All programs derived from this package must cite it.

This package contains functions specific to using `ergm` to model networks whose dyad values are ranks. Examples include preferences, valued ties reduced to ranks, etc..

These terms have a specialized interpretation, and are therefore generally prefixed by "rank.", though they should take any valued data.

For detailed information on how to download and install the software, go to the Statnet project website: [https://statnet.org](https://statnet.org). A tutorial, support newsgroup, references and links to further resources are provided there.

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**References**


AlterSwap-ergmProposal

See Also

ergm-terms, ergm-references

AlterSwap-ergmProposal

A proposal that swaps values of two alters incident on an ego

Description

This proposal randomly selects two dyads \((i, j)\) and \((i, j')\) with a common sender and proposes to swap their values if distinct.

Details

This proposal is not referenced in the lookup table.

CompleteOrder-ergmReference

A uniform distribution over the possible complete orderings of the alters by each ego

Description

A uniform distribution over the possible complete orderings of the alters by each ego

Usage

# CompleteOrder

See Also

ergmReference for index of reference distributions currently visible to the package.
Description

These 14 networks record weekly sociometric preference rankings from 17 men attending the University of Michigan in the fall of 1956; Data were collected longitudinally over 15 weeks, although data from week 9 are missing.

Format

A list of 15 networks.

Details

The men were recruited to live in off-campus (fraternity) housing, rented for them as part of the Michigan Group Study Project supervised by Theodore Newcomb from 1953 to 1956. All were incoming transfer students with no prior acquaintance of one another.

The data set, derived from one in the unreleased netdata package, contains a network list newcomb with 14 networks. Each network is complete and contains two edge attributes:

- `list("rank")` the preference of the $i$th man for the $j$th man from 1 through 16, with 1 being the highest preference.
- `list("descrank")` the same, but 1 indicates lowest preference.

Licenses and Citation

If the source of the data set does not specified otherwise, this data set is protected by the Creative Commons License https://creativecommons.org/licenses/by-nc-nd/2.5/.

When publishing results obtained using this data set the original authors should be cited. In addition this should be cited as:

Vladimir Batagelj and Andrej Mrvar (2006): Pajek datasets
http://vlado.fmf.uni-lj.si/pub/networks/data/

Source

http://vlado.fmf.uni-lj.si/pub/networks/data/ucinet/ucidata.htm#newfrat

References


Examples

```r
# Note: This takes a long time.
data(newcomb)

# Fit a model for the transition between initial (time 0) ranking and
# ranking after one week (time 1). Note that MCMC interval has been
# decreased to save time.
newcomb.1.2.fit <- ergm(newcomb[[2]]~
  rank.inconsistency(newcomb[[1]],"descrank")+
  rank.deferece+rank.nonconformity("all")+
  rank.nonconformity("localAND"),
  response="descrank", reference=CompleteOrder,
  control=control.ergm(MCMC.interval=10))

# Check MCMC diagnostics (barely adequate).
mcmc.diagnostics(newcomb.1.2.fit)
summary(newcomb.1.2.fit)
```

**rank.deferece**

*Deferece (aversion)*

**Description**

Measures the amount of "deferece" in the network: configurations where an ego \(i\) ranks an alter \(j\) over another alter \(k\), but \(j\), in turn, ranks \(k\) over \(i\). A lower-than-chance value of this statistic and/or a negative coefficient implies a form of mutuality in the network.

**Usage**

```r
# valued: rank.deferece
```

**rank.edgecov**

*Dyadic covariates*

**Description**

Models the effect of a dyadic covariate on the propensity of an ego \(i\) to rank alter \(j\) highly.

**Usage**

```r
# valued: rank.edgecov(x, attrname)
```
Arguments

\texttt{x, attrname} either a square matrix of covariates, one for each possible edge in the network, the name of a network attribute of covariates, or a network; if the latter, optional argument \texttt{attrname} provides the name of the quantitative edge attribute to use for covariate values (in this case, missing edges in \texttt{x} are assigned a covariate value of zero).

\texttt{rank.inconsistency-ergmTerm}

\emph{(Weighted) Inconsistency}

Description

Measures the amount of disagreement between rankings of the focus network and a fixed covariate network \texttt{x}, by counting the number of pairwise comparisons for which the two networks disagree.

Usage

\# valued: \texttt{rank.inconsistency(x, attrname, weights, wtname, wtcenter)}

Arguments

\texttt{x, attrname} \texttt{x} can be a network with an edge attribute \texttt{attrname} containing the ranks or a matrix of appropriate dimension containing the ranks. If \texttt{x} is not given, it defaults to the LHS network, and if \texttt{attrname} is not given, it defaults to the response edge attribute.

\texttt{weights} optional parameter to weigh the counts. Can be either a 3D \(n \times n \times n\)-array whose \((i, j, k)\) th element gives the weight for the comparison by \(i\) of \(j\) and \(k\) or a function taking three arguments, \(i, j, \) and \(k\), and returning the weight of this comparison.

\texttt{wtname, wtcenter} If \texttt{wtcenter=\text{TRUE}}, the calculated weights will be centered around their mean. \texttt{wtname} can be used to label this term.

\texttt{rank.nodeicov-ergmTerm}

\emph{Attractiveness/Popularity covariates}

Description

Models the effect of one or more nodal covariates on the propensity of an actor to be ranked highly by the others.
rank.nonconformity-ermTerm

Usage

    # valued: rank.nodeicov(attr)

Arguments

    attr    quantitative attribute (see Specifying Vertex attributes and Levels (?nodal_attributes) for details.)

Description

Measures the amount of "nonconformity" in the network: configurations where an ego \(i\) ranks an alter \(j\) over another alter \(k\), but ego \(l\) ranks \(k\) over \(j\).

Usage

    # valued: rank.nonconformity(to, par)

Arguments

    to
    which controls to whom an ego may conform:

    • "all" (the default): Nonconformity to all egos is counted. A lower-than-chance value of this statistic and/or a negative coefficient implies a degree of consensus in the network.
    • "localAND": Nonconformity of \(i\) to ego \(l\) regarding the relative ranking of \(j\) and \(k\) is only counted if \(i\) ranks \(l\) over both \(j\) and \(k\). A lower-than-chance value of this statistic and/or a negative coefficient implies a form of hierarchical transitivity in the network. This is the recommended form of local nonconformity (over "local1" and "local2").
    • "local1": Nonconformity of \(i\) to ego \(l\) regarding the relative ranking of \(j\) and \(k\) is only counted if \(i\) ranks \(l\) over \(j\).
    • "local2": Nonconformity of \(i\) to ego \(l\) regarding the relative ranking of \(j\) and \(k\) is only counted if \(i\) ranks \(l\) over \(k\).
    • "thresholds": Nonconformity of \(i\) to ego \(l\) regarding the relative ranking of \(j\) and \(k\) is only counted if \(i\) ranks \(l\) above \(par\), where \(par\) can be a vector with multiple thresholds.
    • "geometric": Nonconformity of \(i\) to ego \(l\) regarding the relative ranking of \(j\) and \(k\) is weighted by \(par\) taken to the power of the rank of \(l\) by \(i\), where \(par\) is a scalar.

    par
    additional parameters for some types of nonconformity.
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