

# Package ‘ergm.userterms’

May 15, 2019

**Version** 3.10.0

**Date** 2019-05-15

**Title** User-specified Terms for the statnet Suite of Packages

**Depends** network ( $\geq 1.15$ ), ergm ( $\geq 3.10.1$ )

**Imports** statnet.common ( $\geq 4.2.0$ )

**LinkingTo** ergm

**Description** A template package to demonstrate the use of user-specified statistics for use in 'ergm' models as part of the Statnet suite of packages.

**License** GPL-3 + file LICENSE

**URL** <http://statnet.org>

**BugReports** <https://github.com/statnet/ergm.userterms/issues>

**NeedsCompilation** yes

**Author** Mark S. Handcock [aut],  
David R. Hunter [aut],  
Carter T. Butts [aut],  
Steven M. Goodreau [aut],  
Pavel N. Krivitsky [aut, cre] (<<https://orcid.org/0000-0002-9101-3362>>),  
Martina Morris [aut]

**Maintainer** Pavel N. Krivitsky <[pavel@uow.edu.au](mailto:pavel@uow.edu.au)>

**Repository** CRAN

**Date/Publication** 2019-05-15 07:43:05 UTC

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ergm.userterms-package

*User-defined terms used in Exponential Family Random Graph Models*

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## Description

This package contains template code for user defined (change) statistics that can be used with the **statnet** suite of packages (and **ergm** in particular). To use this package the **statnet** packages **ergm** and **network** are required.

As background, **statnet** is a suite of software packages for statistical network analysis. The packages implement recent advances in network modeling based on exponential-family random graph models (ERGM). The components of the package provide a comprehensive framework for ERGM-based network modeling: tools for model estimation, for model evaluation, for model-based network simulation, and for network visualization. This broad functionality is powered by a central Markov chain Monte Carlo (MCMC) algorithm. The coding is optimized for speed and robustness. For detailed information on how to download and install the software, go to the [ergm](http://ergm.org) website: [statnet.org](http://statnet.org). A tutorial, support newsgroup, references and links to further resources are provided there.

When publishing results obtained using this package the original authors are to be cited as:

Mark S. Handcock, David R. Hunter, Carter T. Butts, Steven M. Goodreau, and Martina Morris. 2003 *statnet: Software tools for the Statistical Modeling of Network Data* [statnet.org](http://statnet.org).

We have invested a lot of time and effort in creating the **statnet** suite of packages for use by other researchers. Please cite it in all papers where it is used.

For complete citation information, use `citation(package="statnet")`.

## Creating User-defined terms using this package

The **statnet** suite of packages allows the user to explore a large number of potential models for their network data. These can be seen by typing `help("ergm-terms", package="ergm")` (once the package **ergm** has been installed). For more information on the models and terms see Morris, Handcock, and Hunter (2008).

The purpose of the package is to allow additional terms can be coded up by users (you!) and be used at native speeds with **statnet**. So the suite of packages can be extended with minimal work by the user. In addition the core packages are not altered and so the new packages benefit from improvements to the core suite.

The process of creating new terms is explained in depth by the document entitled by Hunter, Goodreau, and Handcock (2010) that is found in the `inst/doc` directory of this package.

In brief, to add a new term you need to (all file references are relative to the package directory):

1. Download the source version of this package. For example, in R use `download.packages("ergm.userterms", destdir=".", type="source")`

where `destdir` is the directory to save the source (e.g., `ergm.userterms_3.0.tar.gz`) in.

2. Unpack the source into a directory (e.g., on Linux or the Mac `tar -vzxf ergm.userterms_3.0.tar.gz`).
3. Optionally, rename the package name from `ergm.userterms` to something more evocative of its use (e.g., `myergm`). This can be done using a global change to the files in the directory. Optionally, edit the `DESCRIPTION` file to reflect the use of the package.
4. Edit `R/InitErgmTerm.users.R` to add R `InitErgmTerm` functions for the new terms.
5. Edit `src/changestats.users.c` to add C functions (like the example already in that file) to compute the new change statistics.
6. Compile the package using the usual R tools (e.g., `R CMD build myergm` and `R CMD INSTALL myergm`).
7. Run it! It depends on **ergm** and **network**, of course. See the example below.

## References

Hunter DR, Goodreau SM, Handcock MS (2013). **ergm.userterms**: A Template Package for Extending **statnet**, *Journal of Statistical Software* 52(2), 1-25, URL <http://www.jstatsoft.org/v52/i02/>.

## See Also

`statnet`, `network`, `ergm`, `ergm-terms`

## Examples

```
data(faux.mesa.high)
summary(faux.mesa.high~mindegree(2))
fit <- ergm(faux.mesa.high~mindegree(2), estimate="MPLE")
summary(fit)
```

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eut-upgrade

*Updating [ergm.userterms](#) prior to 3.1*

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## Description

Explanation and instructions for updating custom ERGM terms developed prior to the release of [ergm](#) version 3.1 (including 3.0–999 preview release) to be used with versions 3.1 or later.

## Explanation

[ergm.userterms](#) — Statnet’s mechanism enabling users to write their own ERGM terms — comes in a form of an R package containing files for the user to put their own statistics into (i.e., `changestats.user.h`, `changestats.user.c`, and `InitErgmTerm.user.R`), as well as some boilerplate to support them (e.g., `edgetree.h`, `edgetree.c`, `changestat.h`, `changestat.c`, etc.).

Although the [ergm.userterms](#) API is stable, recent developments in `ergm` have necessitated the boilerplate files in `ergm.userterms` to be updated. To reiterate, the user-written statistic source code (`changestats.user.h`, `changestats.user.c`, and `InitErgmTerm.user.R`) can be used without modification, but other files that came with the package need to be changed.

To make things easier in the future, we have implemented a mechanism (using R's LinkingTo API, in case you are wondering) that will keep things in sync in releases after the upcoming one. However, for the upcoming release, we need to transition to this new mechanism.

## Instructions

The transition entails the following steps. They only need to be done once for a package. Future releases will keep up to date automatically.

1. Download the up-to-date [ergm.userterms](#) source from CRAN using, e.g., `download.packages` and unpack it.
2. Copy the R and C files defining the user-written terms (usually `changestats.user.h`, `changestats.user.c`, and `InitErgmTerm.user.R`) and *only* those files from the old [ergm.userterms](#) source code to the new. Do *not* copy the boilerplate files that you did not modify.
3. If you have customized the package DESCRIPTION file (e.g., to change the package name) or `zzz.R` (e.g., to change the startup message), modify them as needed in the updated [ergm.userterms](#), but do *not* simply overwrite them with their old versions.
4. Make sure that your [ergm](#) installation is up to date, and rebuild [ergm.userterms](#).

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mindegree-term

*New Minimum Degree Term for the 'ergm' Package*

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## Description

This is a new term for the [ergm](#) package that counts the number of nodes in the network with at least a given degree.

## Details

The function [ergm](#) is used to fit linear exponential random graph models, in which the probability of a given network,  $y$ , on a set of nodes is  $\exp\{\theta \cdot g(y)\} / c(\theta)$ , where  $g(y)$  is a vector of network statistics for  $y$ ,  $\theta$  is a parameter vector of the same length and  $c(\theta)$  is the normalizing constant for the distribution.

The network statistics  $g(y)$  are entered as terms in the function call to [ergm](#). The [ergm](#) package contains a wide range of terms. For the details on the possible `<model terms>`, see [ergm-terms](#).

The [ergm.userterms](#) package provides a template for adding new terms. The terms can be used throughout the [ergm](#) package and behave identically to the supplied terms.

## The Minimum Degree Term

`mindegree(mindeg, by=NULL)` *Minimum Degree*: The `mindeg` argument is an integer. This term adds one network statistic to the model being the number of nodes in the network of at least degree `mindeg`. That is, the statistic equals the number of nodes in the network with `mindeg` or more edges. The optional argument `by` is a character string giving the name of an attribute in the network's vertex attribute list. If this is specified, then degrees are calculated using the subnetwork consisting of only edges whose endpoints have the same value of the `by` attribute. This term can only be used with undirected networks.

## References

Hunter DR, Goodreau SM, Handcock MS (2013). **ergm.userterms**: A Template Package for Extending **statnet**, Journal of Statistical Software 52(2), 1-25, URL <http://www.jstatsoft.org/v52/i02/>.

## See Also

statnet, network, ergm, ergm-terms

## Examples

```
data(florentine)
summary(flomarriage~mindegree(3))
summary(flomarriage~mindegree(1,by="priorates"))
fit <- ergm(flomarriage~edges+mindegree(1,by="priorates"))
summary(fit)
```

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