

# Package ‘rope’

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**Title** Model Selection with FDR Control of Selected Variables

**Version** 1.0

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**Description** Selects one model with variable selection FDR controlled at a specified level. A q-value for each potential variable is also returned. The input, variable selection counts over many bootstraps for several levels of penalization, is modeled as coming from a beta-binomial mixture distribution.

**Depends** R (>= 3.1.0)

**Suggests** Matrix, parallel, knitr, rmarkdown

**License** GPL-3

**LazyData** true

**VignetteBuilder** knitr

**RoxygenNote** 6.0.0

**NeedsCompilation** no

**Repository** CRAN

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explore	<i>Run first step of model fitting to find good penalization interval</i>
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**Description**

Run first step of model fitting to find good penalization interval

**Usage**

```
explore(data, B, mc.cores = getOption("mc.cores", 2L))
```

**Arguments**

data	Matrix of variable presence counts. One column for each variable, one row for each parameter value (e.g. levels of regularization).
B	Number of bootstraps used to construct data. At least 21 are needed for u-shape test heuristic to work, but in general it is recommended to use many more.
mc.cores	Number of threads to run in parallel (1 turns of parallelization)

**Value**

A list with components

pop.sep	vector of values saying how separated true and false variables are for each level of penalization
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exploregraph	<i>Convenience wrapper for explore for adjacency matrices</i>
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**Description**

When modeling graphs it may be more convenient to store data as matrices instead of row vectors.

**Usage**

```
exploregraph(data, B, ...)
```

**Arguments**

data	List of symmetric matrices, one matrix for each penalization level
B	Number of bootstraps used to construct data. At least 21 are needed for u-shape test heuristic to work, but in general it is recommended to use many more.
...	Additional arguments are passed on to explore.

**Value**

A list with components

pop.sep            vector of values saying how separated true and false variables are for each level of penalization

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plotrope            *Plot rope results*

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**Description**

Plot rope results

**Usage**

```
plotrope(result, data, types = c("global"), ...)
```

**Arguments**

result            An object returned by rope or explore

data              Matrix of variable presence counts. One column for each variable, one row for each parameter value (e.g. levels of regularization).

types             List of names of plots to draw (alternatives 'global', 'q-values' or 'fits')

...                Pass level=v for a vector v of indices when drawing the fits plot to only plot for penalization levels corresponding to v

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rope                *FDR controlled model selection*

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**Description**

Estimates a model from bootstrap counts. The objective is to maximize accuracy while controlling the false discovery rate of selected variables. Developed for high-dimensional models with number of variables in the order of at least 10000.

**Usage**

```
rope(data, B, fdr = 0.1, mc.cores = getOption("mc.cores", 2L),
      only.first = FALSE)
```

**Arguments**

data	Matrix of variable presence counts. One column for each variable, one row for each parameter value (e.g. levels of regularization).
B	Number of bootstraps used to construct data. At least 21 are needed for u-shape test heuristic to work, but in general it is recommended to use many more.
fdr	Vector of target false discovery rates to return selections for
mc.cores	Number of threads to run in parallel (1 turns of parallelization)
only.first	Skip second part of algorithm. Saves time but gives worse results.

**Value**

A list with components

selection	matrix (one row for each fdr target, one column for each variable)
q	vector of q-values, one for each variable
level	index of most separating parameter value
alt.prop	estimated proportion of alternative variables

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**Examples**

```
## Not run:
data # a matrix of selection counts, for 100 bootstraps, with ncol(data)
# potential variables counted for nrow(data) different penalization levels
fdr <- c(0.05, 0.1)
result <- rope(data, 100, fdr)

## End(Not run)
```

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ropegraph

*Convenience wrapper for rope for adjacency matrices*


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**Description**

When modeling graphs it may be more convenient to store data as matrices instead of row vectors.

**Usage**

```
ropegraph(data, B, ...)
```

**Arguments**

<code>data</code>	List of symmetric matrices, one matrix for each penalization level
<code>B</code>	Number of bootstraps used to construct data. At least 21 are needed for u-shape test heuristic to work, but in general it is recommended to use many more.
<code>...</code>	Additional arguments are passed on to <code>rope</code> .

**Value**

A list with components

<code>selection</code>	list of symmetric matrices, one matrix for each fdr target
<code>q</code>	symmetric matrix of q-values
<code>level</code>	index of most separating parameter value
<code>alt.prop</code>	estimated proportion of alternative variables

**Examples**

```
## Not run:
data # a list of symmetric matrices, one matrix for each penalization level,
# each matrix containing selection counts for each edge over 100 bootstraps
fdr <- c(0.05, 0.1)
result <- rope(data, 100, fdr)

## End(Not run)
```

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scalefree

*A simulated data set for a scale-free network of 200 nodes*

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**Description**

The data set contains 175 observations for each node, the true network structure `dat` was used to generate data and edge presence counts from glasso over 100 bootstraps.

**Usage**

```
scalefree
```

**Format**

A list containing:

**x** A matrix of 175 observations (rows) for 200 variables (columns)

**g** The generating network structure (as a vector)

**B** 100, the number of bootstraps used when counting edge presence

**lambda** The range of penalization used for glasso (the first 9 generate U-shaped histograms)

**W** A matrix of length( $\lambda$ ) rows and  $200 \times 199/2$  columns containing presence counts for each edge and each level of penalization

**Wlist** A list of length( $\lambda$ ) containing matrices of size 200 by 200, the data in W but in an alternative format

**gmatrix** A 200 by 200 matrix, the data in g but in an alternative format

symmetric.matrix2vector

*Take upper half of matrix and convert it to a vector*

### Description

If variable selection counts are in a matrix this function converts them into vector to input into rope. Can be useful when variables correspond to edges in a graph.

### Usage

symmetric.matrix2vector(m)

### Arguments

m                      A symmetric matrix

vector2symmetric.matrix

*Convert vector that represents half of a symmetric matrix into a matrix*

### Description

This can be convenient for using output when rope is used for selection of graph models.

### Usage

vector2symmetric.matrix(v)

### Arguments

v                      A vector with length  $p \times (p-1)/2$  for some integer p

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