Package ‘geneRecommender’

March 22, 2017

Version 1.46.0

Date 2005-04-5

Title A gene recommender algorithm to identify genes coexpressed with a query set of genes

Author Gregory J. Hather <ghather@stat.berkeley.edu>, with contributions from Art B. Owen <art@stat.stanford.edu> and Terence P. Speed <terry@stat.berkeley.edu>

Maintainer Greg Hather <ghather@stat.berkeley.edu>

Depends R (>= 1.8.0), Biobase (>= 1.4.22), methods

Imports Biobase, methods, stats

Description This package contains a targeted clustering algorithm for the analysis of microarray data. The algorithm can aid in the discovery of new genes with similar functions to a given list of genes already known to have closely related functions.

License GPL (>= 2)

biocViews Microarray, Clustering

NeedsCompilation no

R topics documented:

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>gr.cv A function for cross validation</td>
<td>1</td>
</tr>
<tr>
<td>gr.main</td>
<td>3</td>
</tr>
<tr>
<td>gr.normalize</td>
<td>4</td>
</tr>
</tbody>
</table>

Index

gr.cv

Description

gr.cv performs leave-one-out cross validation with gr.main for each element of the query.

Usage

gr.cv(normalized.dataset, query, fun = median)
Arguments

normalized.dataset
A matrix or ExpressionSet containing the normalized gene expression data. The rows correspond to genes, the columns correspond to experiments, and the entries correspond to the gene expression levels. The rows must be labeled. The values contained in `normalized.dataset` must be either finite or NA.

query
A vector containing the query set of genes. These should correspond to the row names of `normalized.dataset`. The query must contain at least 2 elements.

fun
A function used in choosing the number of experiments to include in the calculation. See the help file for `gr.main` for details.

Details

In addition to measuring performance, the results of the cross validation can be used to determine if some element(s) in the query might not belong. If one of the elements in the output vector was very large, one would suspect that the associated gene was regulated differently than the other genes in the query.

Value

A vector containing the rank of each element in the query produced by applying `gr.main` to the query with that element removed.

Author(s)

Gregory J. Hather <ghather@stat.berkeley.edu>
with contributions from from Art B. Owen <art@stat.stanford.edu>
and Terence P. Speed <terry@stat.berkeley.edu>.

References


See Also

`gr.main`, `gr.normalize`

Examples

```r
# This example uses the geneData dataset from the Biobase package
data(geneData)
my.query <- c("31730_at", "31331_at", "31712_at", "31441_at")
normalized.data <- gr.normalize(geneData)
gr.cv(normalized.data, my.query)
```
A gene recommender algorithm to identify genes coexpressed with a query set of genes

Description
The function `gr.main` implements the Gene Recommender algorithm described in Owen et al (2003). Note that in order for `gr.main` to provide meaningful results, the normalization procedure `gr.normalize` must first be applied to the gene expression matrix.

Usage
```
gr.main(normalized.dataset, query, fun = median, ngenes = NULL, extra = FALSE)
```

Arguments
- `normalized.dataset`: A matrix or ExpressionSet containing the normalized gene expression data. The rows correspond to genes, the columns correspond to experiments, and the entries correspond to the gene expression levels. The rows must be labeled. The values contained in `normalized.dataset` must be either finite or NA.
- `query`: A vector containing the query set of genes. These should correspond to the row names of `normalized.dataset`. The query must contain at least 2 elements
- `fun`: A function used in choosing the number of experiments to include in the calculation. See below for details.
- `ngenes`: The number of genes to return in the result. Its default value is the number of genes found at 50 percent recall.
- `extra`: A logical value. When false, the output list will contain only one item, `result`. When true, several other quantities (listed below) will be calculated and added to the output list.

Details
Given data from a large number of microarray experiments and a query set of genes, which genes have expression profiles that are similar to the query? The Gene Recommender algorithm (Owen et al, 2003) answers this question by first identifying the set of experiments over which the query genes behave similarly. Next, the algorithm ranks all the genes based on the strength of the correlation with the query across the chosen set of experiments.

The algorithm must choose how generous to be in including experiments. How many experiments should be included? The algorithm tries every number of experiments and chooses the number which minimizes a score. In the paper, the score was defined as the median of the ranks of the query genes. In `gr.main`, the score can be computed with the user-defined function, `fun`.

Value
A list containing entries:
- `result`: An array of dimensions (ngenes, 2). Column 1 contains the resulting genes, with the highest scoring genes listed first. Column 2 contains character strings, indicating whether the corresponding gene is from the query list or not.
fifty.percent.recall
   Number of genes found at 50 percent recall.

experiments.included
   Experiments included in the analysis.

experiments.excluded
   Experiments excluded from the analysis.

s.g.i
   An array used as a measure of biological significance for each gene. The output is ranked by this quantity.

z.g.i
   An array used as a measure of statistical significance for each gene.

collection
   An array indicating the contribution of each experiment to each gene result. For a given gene and a given experiment, the contribution indicates how strongly the experiment suggests that the gene should be high ranking. Using notation from the article, contribution is defined as $\bar{Y}_{Q,j} \times Y_{ij}$.

Note
   The results of gr.main will differ from the results generated from the C code released by Owen et al (2003). This is due to differences in the implementation. See the vignette for details.

Author(s)
   Gregory J. Hather <ghather@stat.berkeley.edu>
   with contributions from from Art B. Owen <art@stat.stanford.edu>
   and Terence P. Speed <terry@stat.berkeley.edu>.

References

See Also
   gr.normalize, gr.cv

Examples
   #This example uses the geneData dataset from the Biobase package
data(geneData)
my.query <- c("31730_at", "31331_at", "31712_at", "31441_at")
normalized.data <- gr.normalize(geneData)
gr.main(normalized.data, my.query, ngenes = 10)

gr.normalize A function for normalization

Description
   gr.normalize normalizes a matrix of gene expression data as part of the implementation of the Gene Recommender algorithm described in Owen et al (2003). gr.normalize must be applied to the data before running gr.main.
Usage

gr.normalize(unnormalized.dataset)

Arguments

unnormalized.dataset

A matrix or ExpressionSet containing the normalized gene expression data. The rows correspond to genes, the columns correspond to experiments, and the entries correspond to the gene expression levels. The rows must be labeled.

Details

gr.normalize normalizes the data so that for each gene, the gene expression measurements are distributed uniformly between -1 and 1.

Value

The normalized gene expression data, in the same format as the input.

Author(s)

Gregory J. Hather <ghather@stat.berkeley.edu>
with contributions from from Art B. Owen <art@stat.stanford.edu>
and Terence P. Speed <terry@stat.berkeley.edu>.

References


See Also

gr.main, gr.cv

Examples

#This example uses the geneData dataset from the Biobase package
data(geneData)
my.query <- c("31730_at", "31331_at", "31712_at", "31441_at")
normalized.data <- gr.normalize(geneData)
Index

*Topic** manip
  gr.cv, 1
  gr.main, 3
  gr.normalize, 4

gr.cv, 1
gr.main, 3
gr.normalize, 4