Package ‘leiden’

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Type Package

Title R Implementation of Leiden Clustering Algorithm

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URL https://github.com/TomKellyGenetics/leiden

BugReports https://github.com/TomKellyGenetics/leiden/issues

Imports methods, reticulate, Matrix, igraph

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Description

Implements the Leiden clustering algorithm in R using reticulate to run the Python version. Requires the python "leidenalg" and "igraph" modules to be installed. Returns a vector of partition indices. Windows users can still this with devtools::install_github("rstudio/reticulate", ref = "86ebb56"); reticulate::use_condaenv("r-reticulate"); reticulate::conda_install("r-reticulate", "leidenalg", channel = "vtraag")

Usage

leiden(
  object,
  initial_membership = NULL,
  weights = NULL,
  node_sizes = NULL,
  resolution_parameter = 1,
  seed = NULL,
  n_iterations = 2L,
  max_comm_size = 0L,
  degree_as_node_size = FALSE,
  laplacian = FALSE
)

Arguments

object An adjacency matrix compatible with igraph object or an input graph as an igraph object (e.g., shared nearest neighbours). A list of multiple graph objects can be passed for multiplex community detection.

partition_type Type of partition to use. Defaults to RBConfigurationVertexPartition. Options include: ModularityVertexPartition, RBERVertexPartition, CPMVertexPartition, MutableVertexPartition, SignificanceVertexPartition, SurpriseVertexPartition, ModularityVertexPartition.Bipartite, CPMVertexPartition.Bipartite (see the Leiden python module documentation for more details)
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initial_membership, weights, node_sizes
Parameters to pass to the Python leidenalg function (defaults initial_membership=None, weights=None). Weights are derived from weighted igraph objects and non-zero integer values of adjacency matrices.

resolution_parameter
A parameter controlling the coarseness of the clusters

seed
Seed for the random number generator. By default uses a random seed if nothing is specified.

n_iterations
Number of iterations to run the Leiden algorithm. By default, 2 iterations are run. If the number of iterations is negative, the Leiden algorithm is run until an iteration in which there was no improvement.

max_comm_size
(non-negative int) – Maximal total size of nodes in a community. If zero (the default), then communities can be of any size.

degree_as_node_size
(defaults to FALSE). If True use degree as node size instead of 1, to mimic modularity for Bipartite graphs.

laplacian
(defaults to FALSE). Derive edge weights from the Laplacian matrix.

Value
A partition of clusters as a vector of integers

Examples

#check if python is available
modules <- reticulate::py_module_available("leidenalg") &
reticulate::py_module_available("igraph")
if(modules){
  #generate example data
  adjacency_matrix <- rbind(cbind(matrix(round(rbinom(4000, 1, 0.8)), 20, 20),
                             matrix(round(rbinom(4000, 1, 0.3)), 20, 20),
                             matrix(round(rbinom(400, 1, 0.1)), 20, 20)),
   cbind(matrix(round(rbinom(400, 1, 0.3)), 20, 20),
         matrix(round(rbinom(4000, 1, 0.8)), 20, 20),
         matrix(round(rbinom(4000, 1, 0.2)), 20, 20)),
   cbind(matrix(round(rbinom(4000, 1, 0.3)), 20, 20),
         matrix(round(rbinom(4000, 1, 0.1)), 20, 20),
         matrix(round(rbinom(4000, 1, 0.9)), 20, 20)))
  rownames(adjacency_matrix) <- 1:60
  colnames(adjacency_matrix) <- 1:60
  #generate partitions
  partition <- leiden(adjacency_matrix)
  table(partition)
  #generate partitions at a lower resolution
  partition <- leiden(adjacency_matrix, resolution_parameter = 0.5)
  table(partition)
  #generate example weights
  weights <- sample(1:10, sum(adjacency_matrix!=0), replace=TRUE)
  partition <- leiden(adjacency_matrix, weights = weights)
table(partition)

# generate example weighted matrix
adjacency_matrix[adjacency_matrix == 1] <- weights
partition <- leiden(adjacency_matrix)
table(partition)

# generate (unweighted) igraph object in R
library("igraph")
adjacency_matrix[adjacency_matrix > 1] <- 1
my_graph <- graph_from_adjacency_matrix(adjacency_matrix)
partition <- leiden(my_graph)
table(partition)

# generate (weighted) igraph object in R
library("igraph")
adjacency_matrix[adjacency_matrix >= 1] <- weights
my_graph <- graph_from_adjacency_matrix(adjacency_matrix, weighted = TRUE)
partition <- leiden(my_graph)
table(partition)

# pass weights to python leidenalg
adjacency_matrix[adjacency_matrix >= 1] <- 1
my_graph <- graph_from_adjacency_matrix(adjacency_matrix, weighted = NULL)
weights <- sample(1:10, sum(adjacency_matrix!=0), replace=TRUE)
partition <- leiden(my_graph, weights = weights)
table(partition)

# run only if python is available (for testing)
}
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