

TSKS11 Hands-On Session 5

Fall 2019

Task: Partitioning into two parts of equal size

Load the file `karate-network.csv`¹ and complete the following tasks:

1. Create the adjacency matrix. Partition the nodes so that nodes $1, \dots, N/2$ are in one group and $N/2 + 1, \dots, N$ are in the other. Visualize the network by using the Matlab program `print_graph.m` and import the resulting `.gv` file in Gephi.

(It is also possible to visualize using another software, Graphviz, running entirely from the command line. To do that, run the script `plotallgraphs.sh`.)

2. Implement the spectral partitioning algorithm with $N_1 = N_2 = N/2$. Visualize the so-obtained partitioning. Comment on the result.
3. Implement the Kernighan-Lin algorithm with $N_1 = N_2 = N/2$. Use the above partition as starting point. Visualize the so-obtained partitioning. Comment on the result. Also compare with the partitioning obtained with the spectral partitioning algorithm.

(Note that the result of the Kernighan-Lin algorithm depends on the initial partition. In order for us to compare your solution to the reference solution, use the above partitioning, that is nodes 1-17 in one set and 18-34 in the other set.)

Matlab is suggested, but the choice of programming language is free.

Hints

- To test your code, you can check with the examples `mini-example.csv` (reference solutions in `KL-mini-example.gv.pdf` and `spectral-mini-example.gv.pdf`)

¹This file is in the “comma-separated” format. It may be read into Matlab by using the function `load`.

and `neural-example.csv` (reference solutions in `KL-neural-example.gv.pdf` and `spectral-neural-example.gv.pdf`).

- When you have solved the partitioning tasks, use `print_graph.m` to generate `.gv` files of your partitioned networks (it should be clear from opening that program in Matlab what in-parameters are expected). Then you essentially have two options:

1. Run, from the command line:

```
>> ./plotallgraphs.sh
```

This script generates `.pdf` and `.png` files with visualizations of all `.gv` files in the directory.

2. Alternatively, import the `.gv` files into Gephi. The easiest way to present your solution in this case is to do the following:
 - Click on the "T" button in the lower most panel in Gephi. If you hover over this button it says "show node labels". You could adjust the font size by using the right slider in the same panel (if you hover over the slider it says "font size scale").
 - Note what nodes are blue/red and their respective node numbers.

Examination

- The program code you have written should be submitted to Urkund: `ollab13.liu@analys.urkund.se`.
- Collaboration on this homework in small groups is encouraged, but each student should perform programming work individually, and individually demonstrate understanding of all tasks.
- Library functions from SNAP, Matlab and the Python standard library may be used freely, but copying of code from other libraries and/or toolboxes, from the Internet, from other students, or from previous years' students is prohibited.
- Individual oral examination takes place in class (computer lab).