

Python for data scientists SP1 2021/2022

Assignment 7

There are two problems in this assignment.

You can either submit:

- One Python file for Problem 1 (solutionA7_P1.py)
- One Python file for Problem 2 (solutionA7_P2.py)
- A PDF file for the explanation part (if any).

Or a Jupyter Notebook with clearly marked solutions for which problems/which tasks and any explanation.

Note: If you add any details or make any assumptions, please clearly describe in your submission.

Problem 1 (two sub-tasks)

Implement DAG-shortest-paths and Dijkstra's algorithms in Python. Show that they work with the example data used in the book Introduction to Algorithms 3rd edition, in Chapter 24.

Problem 2

This problem uses a dataset that is based on the Västtrafik tram network. The dataset consists of 12 files, each for each tram line in Gothenburg area (tram lines 1-11, and line 14). Each file contains a list of the trams stops on that tram line, from one end of the tram line to the other. Each row in a file contains the name of a tram stop and the approximate time (in minutes) from that tram stop to the tram stop that is given on the next line of the file (the last line of a file contains the name of the terminal tram stop for that tram line, and the value "0"). Each file only gives one direction of a particular tram line; the other direction of that tram line can be derived easily from the data in that file (assume that the time between stops A and B will be the same as the time between stops B and A).

Tasks:

1. put all the information about the tram lines, in both directions, into a data structure suitable for route finding purposes.
2. Write Python code that finds the tram-hubs, given the result from the previous step. A tram-hub is defined as a tram stop that is directly connected to at least three others.
3. Write Python code that creates a simplified graph of the tram network whose nodes are the tram-hubs found in the previous step and the terminal stops of each tram line (that is, all non-hub tram stops and non-terminal tram stops should be omitted).
4. Test the algorithms you implemented in Problem 1 on this data.
 - a. To find shortest route to go from Chalmers to Centralstationen.
 - b. To find shortest route to go from Saltholmen to Chalmers.

Write all your observation along the way.