DIT376 Python for Data Science
Assignment 6 – Group Assignment!

There are two problems in this assignment.
To submit:

- A Jupyter notebook (.ipynb) with clearly marked solutions for: Problem 1 and Problem 2. The notebook must show examples that you used to run the codes, and the outputs that you get after running the codes.

- An html file (a result of "Save and Export Notebook As" html of your Jupyter notebook) after you run all the codes or a link to your project if you are using Colab or Deepnote.

Note:

- If you add any details or make any assumptions, clearly describe these in your submission.

- Join a group before submission. Add your name and your group partners's name at the very top of your notebook.

1 Implementing DAG-shortest paths and Dijkstra's algorithms

Implement DAG-shortest-paths and Dijkstra's algorithms in Python. Show that they work with the example data used in Chapter 22 of the book Introduction to Algorithms 4th edition.

2 Using tram network data for finding shortest routes

This problem uses a dataset that is based on the Västtrafik tram network in 2022. The dataset consists of 12 files, each for each tram line in Gothenburg area (tram lines 1-11, and line 13). 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 data about the tram lines, in both directions, into a data structure suitable for route finding purposes.

2. Given the result from the previous step, write Python code that finds the tram-hubs. 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.