

IE801B Homework Assignment 1

Write computer codes for the $O(nm)$ implementation and the dequeue implementation of the modified Bellman-Ford algorithm to solve the shortest path problem with negative arc costs and compare them.

Ahuja et al. (1993, page 143) states that “Empirical studies have ... found that the dequeue implementation examines fewer nodes than do most other label-correcting algorithms.” Design experiments that could confirm this statement and execute the plan. Test with different network sizes, structures, and number of arcs with negative costs. Be careful with negative cycles.

Submit the following files for this assignment:

1. A PDF report that summarizes your code, experiments, and findings. LaTeX is recommended but not required. Using a Jupyter notebook is fine. Describe your experimental settings: CPU, RAM, OS, language version, package version, computational time, number of label corrections, etc. In most cases, this is the only file that I will read. I will read your source code if necessary.
2. Describe how you used AI tools. This is not for grading but for my own education on how students are using AI tools.
3. Your code files.
 - Do NOT submit your algorithm code as a Jupyter Notebook. You can use Jupyter while developing codes, but not in the submission. (But for submission your Jupyter needs to be converted to PDF.)
 - You can write your main code as `main.py` and import it to your Jupyter notebook to create the final report is fine.
 - In your report, specify which source file is the file that I need to run to reproduce the results. If you choose to use C/C++/Java, describe how I can compile and run the code. For C/C++, `cmake` is recommended.
 - By the way, did you know Jupyter = Julia + Python + R?
4. Please upload each file (PDF and source codes) separately without zipping unless you have too many separate files.
5. If you prefer to submit your code via GitHub repo, it is okay too. You need to mention the repo URL and the specific commit SHA. Please make sure that I have access to the repo. My GitHub account name is `chkwon`.

References

Ahuja, R. K., Magnanti, T. L., and Orlin, J. B. (1993). *Network Flows: Theory, Algorithms, and Applications*. Pearson.