

Network Flow Empirical study-Individual Report

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This empirical study project brought to light the performance of different network flow algorithms under varying network topologies. I mostly learnt that the number of nodes, edges and capacities have an impact on the performance of specific algorithms. Moreover, the search algorithm used (DFS/BFS), the data structures used (Adjacency list/Adjacency Matrix) and the method used for graph loading also affects the running time. I felt that due to the graph generation code taking the range of capacities as input, and generating random edge capacities, our analysis was affected as we could not predict how the placement of capacities was affecting our algorithms. The preflow-push algorithm seems to be the best, subject to the case where the number of nodes is not very high. If the number of nodes is high, the scaling Ford-Fulkerson algorithm can be used if the number of edges is not very high. The Ford-Fulkerson algorithm depends heavily on the augmenting path chosen which gets affected due to higher capacities, as number of iterations may increase for a bad augmenting path.

I implemented the Ford-Fulkerson with scaling algorithm. There I searched for the augmenting path using two implementations, DFS and BFS. I tested the merged code extensively on small inputs. Then I generated the test file structure and generated the test files (manually) using the graph generation code provided. Jessica first implemented the automation code which generated the test files automatically, but we did not use this because it generated the test files with random parameters and it would have made it difficult for us to analyze files with random parameters. We wanted to specifically vary nodes while keeping edges and capacities constant. Her code did not allow this. This is when I made the test files structure and manually generated the test files. Then I ran the generated test files and obtained the output in an excel sheet. Swati helped me with this. I and Swati worked on the graph analysis. I made some contributions to the group report and contributed on the ppt.

Swati implemented the Ford-Fulkerson algorithm using both the adjacency list and adjacency matrix representations. She created the tcss543.java file which runs all three algorithms thrice and takes the average. She helped me with running the testing of the files on the algorithms. She worked with me on graph analysis. She wrote the group report and contributed to the ppt.

Jessica implemented the Preflow-Push algorithm. She wrote the automation code used to run the test files on the algorithms. She contributed to the ppt.