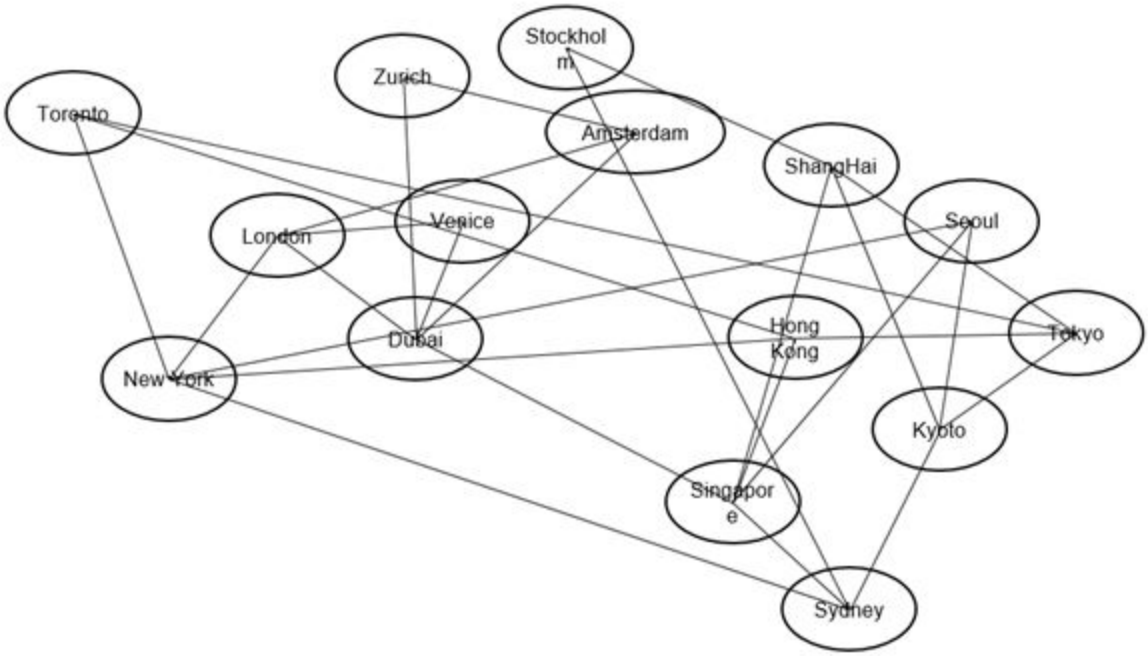
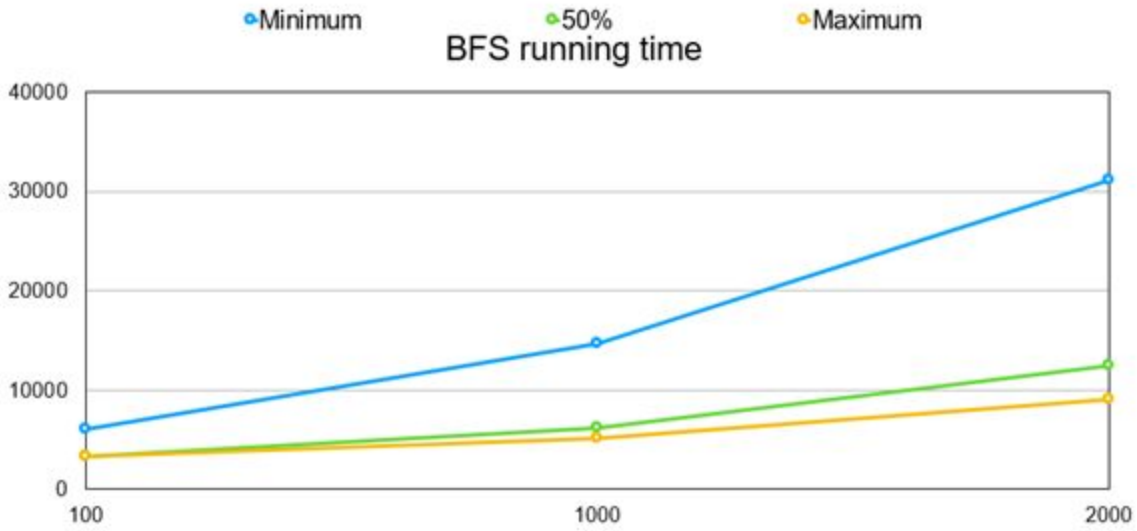
Undirected graph of non-stop airline flights



CPU running time



Based on this graph, we can see that the growth of CPU running time is directly proportional to the size of the graph and the graph is increasing linearly. As array of adjacency list is used, the time complexity of BFS will be O(|V| + |E|). If we use an an adjacency matrices instead, the time complexity will will be O(|V^2|).

2) Explain whether Depth-first search (DFS) algorithm can be used in place of BFS. Why or why not?

DFS cannot be used in place of BFS.

Consider the scenario that there are more than one possible route to the goal node, and our search decided to first expand the left sub-tree of the root. Assuming that there is a solution which however is at a very deep level of the left sub-tree, this long route will be returned according to DFS once the goal node is found. However, the right sub-tree of the root has an efficient solution(near the root) will not be found. As DFS is only able to search for a possible route which may or may not be optimal, it cannot be used in place of BFS.