

Assignment 5

Deliverables: Create a single pdf file that contains your answers and your C++ code. Then create a zip file that contains this pdf file along with all your code source files. Submit this zip file in iLearn.

Deadline: 12/3/2019 11:59 pm.

Exercise 1

Use provided C++ skeleton to insert your code.

A.

Define Graph, which stores an undirected graph using adjacency list, where each node stores a CityName (string) and each edge has an integer weight (distance between two cities).

Implement the following functions in Graph:

- a. `bool IsThereTripletClique():` returns true if there are three nodes in the graph that are all connected to each other. E.g., a,b,c, with edges (a,b),(b,c),(a,c)
- b. `bool isGraphConnected():` returns true if graph is connected
- c. `int GetMinDistance(string city1,string city2):` returns shortest path distance between city1 and city 2. Hint: You may use Dijkstra Algorithm.
- d. [extra credit] `int LongestSimplePath():` returns length of longest simple path (no cycle allowed)

B.

What is the big-Oh complexity of your functions above if graph has n nodes and m edges?

C.

Test your functions. Write code to create a random graph of 100 nodes, with 500 random edges with weight 1, 500 random edges with weight 2 and 500 random edges with weight 3. (For function in A(d) use a smaller graph if too slow.)

Measure the time of each function.