Unit 3 Algorithmics

Submit Task – Week 4

Graph ADTs

1. Describe how you could model a social network where people connect by accepting each other as friends (think Facebook.)

To model a network of friends on a social media, I would use a graph of dictionaries containing the user's information, with edges between each user and their friend(s). This would likely be an Unconnected Cyclic Undirected graph in the overall network. For an individual user's friends it would be a Connected Cyclic Undirected graph

2. How does this change if, instead, people follow other people to see what they post? (this Instagram/Twitter).

The graph would be a directed graph these relations are usually one sided, also the graph would ba wider.

3. How might we use a graph to model a complex series of tasks which must be completed, with some tasks requiring others to be completed first?

A directed acyclic graph would be best for this, each node containing a task and person pair and Edges representing dependencies. This graph would also be ordered to represent the order tasks must be done.

4. A region is modelled such that edges represent roads and nodes represent towns. A road maintenance company inspects every road by driving across it, covering each road exactly once. What is the algorithmic name for this? (And, for bonus points, what must be true about the network for this to be possible?)

A Eulerian Path, The network would be required to be connected for this algorithm to work

5. Can every undirected graph be represented as a directed graph? And vice versa?

Yes, For an undirected graph to be represented as a directed graph all edges would be directed in both directions between 2 nodes. A directed graph could not be lossless converted to an undirected graph, you would either need to completely remove all single direction edges or truncate all edges to being unidirectional.

6. Does a minimum spanning tree have to contain every edge that has the minimum weight of edges in that graph?

No a spanning tree is simply a connected graph with no cycles that spans all the vertices of the original graph with the minimum possible total edge weight. It will not include edges that create cycles regardless of if they are minimum weight. (idk if im interprating this question right)

7. Can you add an edge to a spanning tree so that it is still a spanning tree?

Without adding a node you cant add an edge without making a cycle – which would mean it is no longer a tree.

Python Practice

Use Python to create a small network with five nodes and some edges with weights. (Choose your own scenario – be creative.) Display the output using matplotlib.