CSE 332: Data Structures and Parallelism

Section 10: P/NP, Final Review

Snow Day

After 4 snow days last year, UW has decided to improve its snow response plan. Instead of doing "late start" days, they want an "extended passing period" plan. The goal is to clear enough sidewalks that everyone can get from every classroom to every other **eventually** but not necessarily very quickly.

Unfortunately, UW has access to only one snowplow. Your goal is to determine which sidewalks to plow and whether it can be done in time for the first 8:30 AM lectures.

You have a map of campus, with each sidewalk labeled with the time it will take to plow to clear it.

a) What will the vertices of your graph be?

b) What will the edges be? You should at least say whether your edges are directed or not and whether they're weighted or not.

c) What algorithm will you run on your graph?

d) How will you interpret the output of your algorithm? (i.e. which sidewalks to plow "in the real world" instead of just in graph terms).

e) Briefly (2-4 sentences) explain why your model works. You should at least address why you ran the algorithm you did (e.g., why are you looking for a shortest path/MST/topological ordering/etc.) and how you are ensuring your algorithm will be able to produce an "extended passing period" plowing plan.

P, NP, NP-Complete

a) "NP" stands for:

b) What does it mean for a problem to be in NP?

c) For the following problems, circle ALL the sets they (most likely) belong to:

Is there a path of weight at most k from one vertex to another vertex in a weighted directed graph?

NP   P   NP-complete   None of these

Is there a cycle that visits each edge in a graph exactly once?

NP   P   NP-complete   None of these

Will this program run forever?

NP   P   NP-complete   None of these

Can we find the prefix sum of an array in parallel using 10 processors?

NP   P   NP-complete   None of these

Is there a path that starts and ends at the same vertex that visits every vertex exactly once?

NP   P   NP-complete None of these