CSE 331 Homework IV

Due: Nov 7, 2017, in class.

1. (10 + 10 + 15 = 35 points) Please show the (1) adjacency matrix, (2) adjacency list, and (3) spanning forest induced by breadth first search (BFS) for the following unweighted graph (Figure 1). For BFS, you can arbitrarily select the starting vertex.

![Figure 1](image1)

2. (15 points) Suppose Facebook stores a huge undirected graph for the social network, where each vertex represents a user, and if two users are friends with each other, they are connected by an edge. We assume that there are about $10^9$ users, and each user has about 200 friends on average. Should we use adjacency list or adjacency matrix to represent this graph? Why?

3. (10 + 15 × 2 = 40 points) (1) Show the adjacency list of the following directed graph (Fig. 2), (2) then based on your adjacency list, show the induced spanning tree (or forest) by BFS and DFS.

![Figure 2](image2)

4. (10 points) Use the same graph Fig. 2. Suppose each vertex represents a task, and each directed edge indicates a prerequisite. For example, the edge $v_3 \rightarrow v_4$ indicates that we can start task $v_4$ only when $v_3$ has been finished. Please use topological sort to schedule these 6 tasks (also show your idea in detail that how do you schedule them).