COSC-211 Spring 2019 Final Exam Topics

This exam is cumulative; it will cover all material from the course, though it will be weighted slightly more heavily towards new material since the second midterm. This study guide only includes material since the second midterm; I refer you to the study guides from the first two exams for a review of topics from earlier in the course.

This is *not* a comprehensive study guide. There may be topics that we have discussed in class or that have come up on homework that are not on this list. You are responsible for all of the course material, including both in-class material and homework.

1. ADTs and Data Structures

    (a) Balanced Binary Search Trees

    - Red-Black Trees: properties, how to find/add
    - Splay Trees: how to find/add/remove
    - Asymptotic analysis of the above (know what the results are and the approach we used to obtain the result; I will not ask you to reconstruct the proofs)

    (b) Union-Find

    - What are the supported operations?
    - Linked List implementation
    - Amortized analysis of union-by-size

    (c) Graphs

    - Adjacency list representation
    - Adjacency matrix representation
    - Supported operations and how they work in each representation
    - Properties of graphs: directed vs. undirected, weighted vs. unweighted, cyclic vs. acyclic, sparse vs. dense, connected, complete
    - Search algorithms
        - Breadth-first search: how it works, what data structures it uses
        - Depth-first search: how it works, what data structures it uses
            * Checking whether a graph is cyclic
    - Asymptotic analysis of each of the above
    - Dijkstra's algorithm for finding shortest paths: how it works, what data structures it uses

Some types of questions that I might ask (again, not comprehensive):

- Given a graph, run Dijkstra's algorithm on it.

- Use DFS to solve some new problem on a graph.

- Compare the runtime of an adjacency list and an adjacency matrix for some new graph operation.

- Given a target application, identify which data structure would be most appropriate.

You've gotten lots of practice, on homework, with implementing the data structures we've discussed. The exam will focus more on using the data structures and understanding their performance.