CS 3510: Advanced Algorithms/Data Structures

Spring 2018 Assignment 4

Problems due as noted.

**Assignment**

Problems identified by x.y(z) denote the problem “y”, in chapter “x” of the textbook, with part “z”. If “z” is not noted, then the entire problem is required.

**Due Mar 7 Shortest Paths**

- 4.1 Run Dijkstra, tracking the problem data in a table.
- 4.14 By efficient, we mean no worse than Dijkstra’s algorithm.
- 4.22 Read this problem, and write down your questions about how to turn it into a graph path problem, such that our path algorithms can be modified to solve it.

**Due Mar 9 Shortest Paths**

- 4.2 Run Bellman-Ford, tracking the problem data in a table as we did in class. Each iteration is a new array, based on the previous array. Start from node S.
- 4.11 How can you find cycles using path algorithms in this chapter?
- 4.19 Look for a modified version of Dijkstra that meets the criteria.

**Due Mar 19 Shortest Paths**

- 4.8 Prove = proof, disprove = counter-example
- 4.12 Your algorithm should be O(|V|^2) or better.

**Due Mar 21 Shortest Paths**

- 4.5
- 4.15

**Due Mar 21 Heaps (15 points)**

- Implement the binary heap from Figure 4.16. Measure the performance of decreasekey(), deletemin() and makeheap() as a function of the number of elements in the heap. Create a chart with the runtimes of each of these functions plotted. Include theoretical curves to compare with.

**Submission**

- For the written work, at the beginning of class, on the due dates, submit paper copies of your solutions.
- For the experimental determination, at the beginning of class on the due date, submit paper copies of the graphs.