COP4531 – Complexity and Analysis of Data Structures and Algorithms   **Fall 2017**

Homework 5: Deadline Friday 11/3/2017

Instructor: Viet Tung Hoang

If for some reason you can't show up in class to submit the solution then please email it to the grader Xiaoxiao Gan (xg16c@my.fsu.edu). You don't need to write pseudocode; English description of your algorithm will be fine.

1. [20 points] We are given a directed graph $G = (V, E)$ on which each edge $(u, v) \in E$ has an associated value $r(u, v)$, which is a real number in the range $0 \le r(u, v) \le 1$ that represents the reliability of a communication channel from vertex u to vertex v. We interpret $r(u, v)$ as the probability that the channel from u to v will not fail, and we assume that these probabilities are independent. Give an efficient algorithm to find the most reliable path between two given vertices.

2. [20 points] We are given a directed, weighted graph $G = (V, E)$, where each edge $(u, v) \in E$ has a weight $\ell(u, v) > 0$. Let s and t be two nodes in V. Give an efficient algorithm for finding the shortest path from s to t where you have the option to pick one edge and change its weight to 0. (Hint: you'll need the following simple but useful observation. For a node v in G, a shortest path from v to t in the weighted graph G is also a shortest path from t to v in the (weighted) reverse graph of G, and vice versa.)