

## CS 253 Programming Assignment 4

Fall 2003 (Due November 18, 2003) at the start of class.

Be sure to read the **Programming Style** document when turning in your assignment. You must work in a small group for this assignment with different members than the last three assignments. This assignment will give you experience in the data structures, algorithms, and invariants having to do with graph algorithms. In particular, we will explore various routing algorithms for computer networks and compare the results for single-source shortest path, and minimal spanning tree.

To receive full credit, in addition to all Programming Style requirements, you must

- Generate graph classes for adjacency list and adjacency matrix.
- Generate a random graphs based on edge density  $p$  and weight  $w$ .
- Create spanning trees using (1) Prim's algorithm for MST and (2) Dijkstra's algorithm for shortest path computations.

Normalize the costs to 1, e.g. whatever costs of edges are in the graph, divide them by the maximum. Compare the results of the two methods using (a) normalized cost of edges, (b) average routing distance from a single source to all other destinations.

**For Extra credit**, try to come up with a greedy metric that uses both shortest path and MST to find a tradeoff between cost of edges and average routing distance (this is called a Prim-Dijkstra tree and has many citations on the web for your use) (10 pts).

More extra credit will be given if you print out your trees as they are generated by the two algorithms in "pretty form" (10 pts).

Groups for this Project

Names	Group
Benjamin Milster	1
Jonathan Mitchem	1
Kyle Owen	1
Esteban Aparicio	1
Benjamin Moss	2
Michael Ames	2
Shawn Tracy	2
Robert Pangrazio	2
Nguyen, Hai	3
Qian Fu Jim	3
Hoi Ho	3
Timothy Krupinski	3
Brian Van Vertloo	4
James Townsend	4
Eric Mertens	4
Jeffrey Slane Jr	4

