Algorithms
CMPT 435

— Assignment 4 - 100 points

Goals

- to implement graph and tree data structures, and to understand the performance of their traversals

Requirements and Notes

- Develop several of **your own** implementations of an *undirected graph*. **[60 points]**
  The file `graphs1.txt` contains data describing multiple undirected graphs. Read it and create three versions of each graph:
  1. as a matrix
  2. as an adjacency list
  3. as linked objects

  For each graph, print the matrix and adjacency list versions. For the linked objects version of each graph, perform depth-first and breadth-first traversals, printing each vertex's IDs as you encounter it. (I.e., print all of the vertex IDs in "depth-first" order and then in "breadth-first" order.)

- Develop **your own** implementation of a *binary search tree*. Using the **[30 points]** text file `magicitems.txt` from our web site, populate your BST with that data.
- Randomly select 42 magic items and look up each in the BST. Print the number of comparisons for each lookup and compute the overall average.

- In your LaTeX summary and analysis document, analyze the asymptotic **[10 points]** running time of both graph traversals and **explain why it is that way**. Also analyze the asymptotic running time of BST lookups and **explain that as well**.

Of course, your code must ...
- separate structure from presentation. **[−∞ if not]**
- be professionally formatted yet uniquely yours (show some personality)
- use and demonstrate best practices.
- make me proud to be your teacher.

Resources

- Graphs are described in our text in section 22.1 on via notes linked from our web page.
- Breadth-first and depth-first traversals are described in our text in sections 22.2 and 22.3 respectively.
- Trees are described in our text in chapters 12, 13, and 18.

Submitting Your Work

In addition to your source code, commit your LaTeX document in both .tex and .pdf forms to your GitHub repository. For your code, make **many** commits to GitHub. If you don't make enough commits, I will not accept your work. Be sure that you make your final commit for this assignment on or before the due date. (See our syllabus for those details.)