**ECE 1111: Engineering Computation I**

**Homework No. 11: Lists and Trees in C++ and Python**

**Deposit your work in:**

**/data/courses/ece\_1111/current/homework/hw\_11/<lastname\_firstname>**

**Goal:** The design of a data structure can be crucial to the efficiency with which you can manipulate data. In this assignment, you will compare the efficiency of two search algorithms.

**Description:** Create a text file with random text data that is 10,000,000 lines long (use wc to verify this). For example, use the commands:

**cat /usr/include/\*.h > temp.text**

**cat temp.txt temp.txt >> temp\_2.txt**

until you have a file that is long enough.

1. (/p01) Sort this file using the Unix sort command and time the execution time using the Unix time function (Google search it).
2. (/p02) Write a Python program that reads this file into memory and sorts it - about two lines of Python code ☺. You can use the built-in capabilities for list management and sorting in Python.
3. (/p03) Write a C program that sorts this data, line by line, in lexical order using the Unix binary tree utility (‘man tsearch’) and a linked list. You can use whatever linked list implementation you like, including the code provided in class.
4. (/p04) Convert your C code to a C++ program that uses a linked list. You can use the standard sort tools available in Unix or incorporate code you find from the Internet. You need not write your own sort method. But you must implement your own basic linked list in C++, and provide a sort method as a member function in the class.

Time the performance of all four versions using the Unix time function. Comment on the pros and cons of each approach. Your analysis need not be long – a few paragraphs should suffice. Your code must compile and link using make. You will be graded on both the structure and functionality of your code as well as the quality of the documentation. In a file AAREAMDE.txt, provide an analysis of the run-time efficiency of the four approaches. Keep your explanations simple and to the point.

You can work in teams on this assignment and share code. But your analysis and results must be your own work, and you need to understand every line of the code you submit.