CSE 6833

Homework 1-1 Report

My System

* OS: Windows 10
* Environment: Python 3.10.6
* CPU: Intel i7-9700K

Sorting Algorithm Comparison

Chart, line chart

Description automatically generated

I compared the execution time between merge sort and selection by incrementing the length of a randomized array by 1 continuously and recorded the time taken to execute the algorithm from start to finish. As shown in the graph, the crossing point of these 2 algorithms is when the length of the array is at 60. This means that in my system, when length of the array is more than 60, merge sort has a lower upper bound time complexity than selection sort. Thus, merge sort is asymptotically superior algorithm is also more efficient in practice.

Multiplication Comparison

Chart, line chart

Description automatically generated

I compared the execution time of multiplication using Karatsuba and Grade School method by increasing the number of digits and randomize the two numbers. I then multiply both numbers with the 2 different methods and recorded the execution time. As shown in the graph, the crossing point of these 2 algorithms is when the number of digits is at 62. This means that in my system, when the number of digits used for multiplication is more than 62, Karatsuba multiplication has a lower upper bound time complexity than Grade School multiplication. Thus, Karatsuba multiplication is asymptotically superior algorithm is also more efficient in practice.