CSE 412: Design and Analysis of Algorithms, Fall 2025

Programming Homework 1. Due: Friday, September 5, 2025 on LMS

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1. Calculate the empirical running times (stopwatch time) for functions with their asymptotic times as following:

$O(n)$	$O(n \log n)$	$O(n^2)$	$O(n^3)$	$O(2^n)$	$O(n!)$

   Create a table for running times for $n = 1, 10, 100, \ldots, 10^{10}$. [Some functions would take enormous amount of time for large values of n so ignore them.]

2. Implement the MERGESORT algorithm.

3. Implement the INSERTIONSORT algorithm with recursion.

4. Implement the INSERTIONSORT algorithm without recursion.

5. Implement the BUBBLESORT algorithm.

6. Calculate empirical running times for these sorting algorithms on following data of size n, for $n = 10, 100, \ldots, 10^6$.
   (a) Randomly generated integer data.
   (b) Randomly generated floating-point data.
   (c) Integer data already sorted in ascending order.
   (d) Integer data already sorted in descending order.