COMP 3711 Design and Analysis of Algorithms
Fall 2015
Programming Assignment 1

Implement bubble sort, insertion sort, and quicksort in your favourite programming language, and perform the following experiments.

1. Generate an array of $n = 100,000$ random 32-bit integers. Run the three sorting algorithms on the array and record the time it spends. [Hint: Don't use your own stopwatch! Use system calls that can measure the time in microseconds, e.g., `gettimeofday` on Linux.]

2. Repeat the above experiment with $n = 100,000 \cdot i$ for $i = 1, 2, \ldots, 10$, and plot the running times of these algorithms as they grow with n. You can stop plotting the running times for bubble sort and insertion sort when they are too slow, say taking more than 1 minute.

3. Can you construct an input array on which insertion sort is the fastest? Try it with an experiment and report the running times of these three algorithms on this particular input. Can you construct an input array on which bubble sort is the fastest?

What to submit:

1. A printout of your source code of the 3 algorithms.

2. The experimental results and figures you have plotted.

3. Any discussion you want to add to your experimental results.