

## Programming Assignment #1

Due: Tuesday, 02/27/2024, at midnight.

Please note that this programming assignment will be part of the overall homework category but will be worth the same as two homework assignments.

Please email your code and accompanying files to [rbeach3@vols.utk.edu](mailto:rbeach3@vols.utk.edu).

In class we discussed the median-of-medians algorithm, which solves the selection problem in

linear time. Implement a quicksort algorithm that uses this method to select the pivot value.

Specifically:

- Try setting  $r$  at 3, 5, 7, 9, and 11. Explain the behavior firsthand. (The behavior here will be a key indicator on if your code is working properly)
- Implement a straight insertion sort to sort  $n$  when it becomes small
- Experimentally determine the value of  $n$  at which quicksort should revert to insertion sort

and unwind the recursion. Describe how you made this determination, and the factors

upon which it depended.

You may use any programming language you like, so long as your code compiles and runs on the

EECS lab machines using only software currently installed. A user should see something similar

to the following when running your program.

```
UNIX>> ./sort input_file
```

```
2 5 8 11 23 34 52
```

```
UNIX>>
```

PAY CLOSE ATTENTION TO THIS: the program must run using a .txt file as input with every number in said file separated by a '\n'. If your code does not run this way it will not be accepted. The input will be capped at one million elements.

You should submit a .tar or .zip file containing the following:

- Your code (.py, .cpp, .jar, etc. - no notebook style scripts will be accepted)
- A readme of how to run your code.
- A 1-page write-up explaining your experimentally determined choices of  $r$  and  $n$  as

described above. Graphs and/or tables to support your choice should be included.

Please

also include any other important implementation specific details about your code.

- A makefile (if your code requires compilation)