Fundamental Algorithm Techniques

Problem Set #2–#3

Due: October 12, 2025

Problem 1 (Sorting Algorithms)**.** *Write Sorting Algorithms:*

1. *write own bad $\mathcal{O}(n^2)$ sorting*
2. *create few tests of various sizes and control that algo. is working*
3. *write own Quick Sort*
   - *add random pivot*
   - *add average pivot (down + middle + up)*
4. *write own Merge Sort*
5. *write own Heap Sort*

Problem 2 (Analyse Sorting Algorithms)**.** *Analyse succintly, for all sorting Algorithms above, time and space complexities using the master theorem where applicable*

Problem 3 (Compare Sorting Algorithms)**.** *Compare practical performance of your algorithms on own dataset. Competitors are:*

- *Bad sorting*
- *improved Quick Sort*
- *Merge Sort*
- *Heap Sort*

Create very basic report (table, plot, markdown, latex, ...)

Problem 4 (Git pull your work!)**.** *create git branch and git pull your: code, analysis and experiments. Use your secret, correct* **ID number** *that I will give you!*

Problem 5 (Bonus Points??)**.** *2 different languages (with different paradigm) in repo. Feel free to share your epic fails:-)!*