

# CS 124 Project 4

Due on Blackboard by Wednesday, November 8

For this project, you will sort the 1000 objects from your data set. You will modify each sorting algorithm to collect data. You will analyze the results from the different sorting algorithms.

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## Implement

- You should have your 1000+ objects stored in a vector, initially unsorted.
- Choose three sorting algorithms:
  1. Bubble Sort
  2. Selection Sort or Insertion Sort
  3. Merge Sort or Quick Sort
- Use each sorting algorithm to sort a vector of the first 100 objects from your dataset. Record the number of reads (the number of times you get the value of an element of the vector) and writes (the number of times you assign into an element of the vector). Then do the same for a vector of size 200, 300, 400, 500, 600, 700, 800, 900, and 1000. Each of the three sorting algorithms should be given identical unsorted vectors to sort.
- Analyze the data. Look at how the number of reads and writes grows when the number of objects to sort grows, compare and contrast the different sorting algorithms, draw conclusions. Discuss complexities and their effects. All of this will go in your writeup.
- In your writeup, also include answers to the following questions: If you need to sort a contacts list on a mobile app, which sorting algorithm(s) would you use and why? What about if you need to sort a database of 20 million client files that are stored in a datacenter in the cloud?
- You must submit your .cpp file(s), your data file(s), and your writeup. Please submit your writeup in PDF format.

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## Extra Credit

To earn up to 10 extra credit points (at the grader's discretion), you can get more thorough results. This can include:

- Setting timers to record how long it takes you to sort the objects with each algorithm
- Performing the same experiment, except double the size of the data set each time (instead of having it grow linearly)
- Using more sorting algorithms (e.g. the other options given above, radix sort and/or bucket sort if they make sense to use with your objects)

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## Grading

The project is out of 75 points.

- 5 pts Program compiles and runs.
- 5 pts Code style. Readable, naming style is consistent, comments where appropriate.
- 6 pts Used three sorting algorithms according to the directions above.
- 15 pts Sorted the 100, 200, ... 1000 objects according to the directions above.
- 24 pts Recorded the number of reads and writes for each sort.
- 15 pts Analyzed the results.
  - 5 pts Writeup: professional, grammatically correct, cites sources, at least 500 words.