RESEARCH PROJECT:
Data Structures, Algorithms, and Big O

CL Computer Science

Overview

For your final presentation in CL Computer Science, you will conduct some personal research into a topic centered around data structures, algorithms, and something we like to call "Big O." On the last day of class, you will present your findings to your classmates so we can all learn a bit together!

Research Topics

Choose a topic from the list below, or suggest one of your own!

Suggested topics

- Sorting algorithms (must compare/contrast at least two)
  - Selection sort
  - Insertion sort
  - Bubble sort
  - Quicksort
  - Merge sort
  - Heap sort
- Search algorithms (must compare/contrast at least two)
  - Breadth-first search
  - Depth-first search
  - Dijkstra's algorithm
  - A* search algorithm
- Data structures
  - Linked lists
  - Binary trees
  - Stacks/queues

Presentation Requirements

For your final, you must prepare an 8-10 minute slideshow presentation which answers the following questions:

- What is "Big O," and why is it important in computer science?
- What is your research topic, and what drew you to it?
- What are the motivating factors behind your topic? Why is it important?
- Explain the basic mechanics of your topic. How does it work?
    - Give a full, worked-out example of your topic in action. For example, if your topic is sorting algorithms, then demonstrate *selection sort* as a series of slides or as physical numbers on cards.
    - Analyze the Big O runtime of the primary functions of your topic.
    - If you're working with data structures, you must explain and analyze the Big O runtime of the following three functions:
        - `add(elem)`
        - `remove(elem)`
        - `contains(elem)`
- What makes this topic relevant?
    - How is it related to things we covered in class?
    - Where do we see it in action in real life?