CSCI 2270 – Lecture 1

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Today:

- **What is "Data Structures and Algorithms"?**

- **Course Logistics**
  - Grading
  - Textbook
  - Recitations
  - A little bit about me, and computer science

Back to Intro Programming…

Most of you are coming from some coding background

- High school
- Another major/field

Reasons for learning to code initially

- Intentional interest
- Required for another major
- Your mom made you do it
- You got lost on your way to English 100
- Accidental

Reasons for enrolling in CSCI 2270?

If you are here, presumably you enjoy programming and want to know more

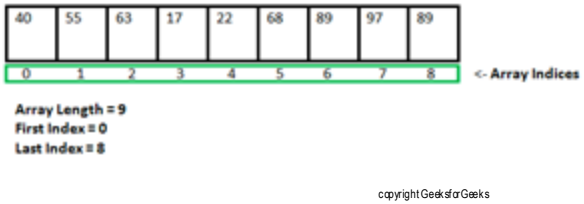
What are "Data Structures"?

Data Structures and Algorithms

When you first learn to program, you begin using data structures right away:

variable

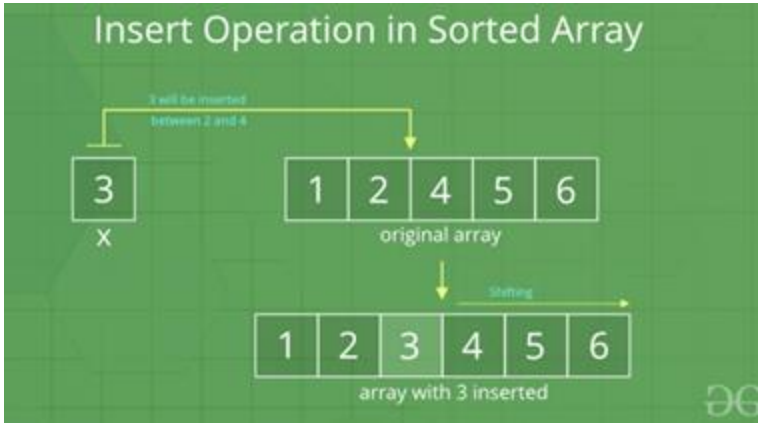
array



What is a Data Structure?

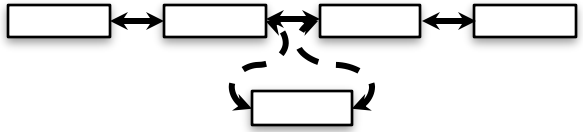
Say we have a "sorted" array

- We want to insert an element



How many operations are needed?

Example DS: Linked list



Collection of objects linked together

Features:

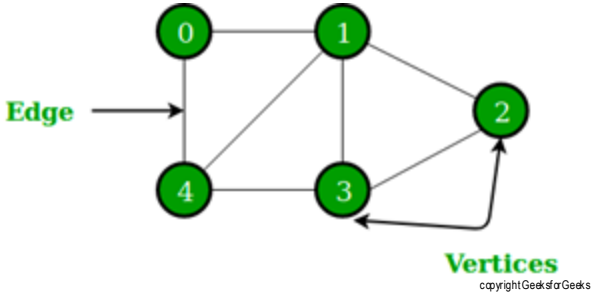
- Each element is an individual object
- Object allocated in dynamic memory space
- Not contiguous in mem space
- Pointers in memory establish order
- Add, remove by changing pointers
- Number of objects not fixed

Example DS: Binary Search Tree

- What if we care about search performance for a sorted list of items?
  - example: dictionary
- How many operations would we need to perform on an ordered array? Linked list?
- BST: worst case – height-of-the-tree number of operations

Fig 1: An example of a binary search tree

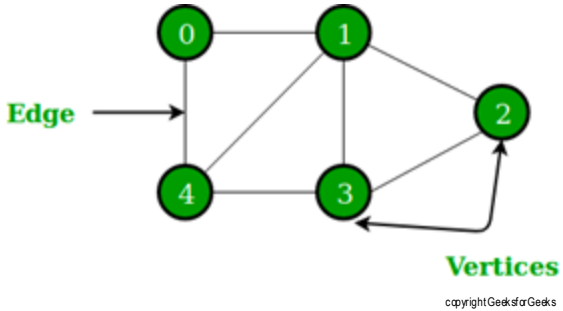
Example DS: Graph



- What if we want to represent how certain entities are interconnected?
- Graph:
  - Each element is called a vertex
  - Each connection is called an edge
  - Vertex stores data
  - Edges represent interconnectivity within graph
  - Example uses:

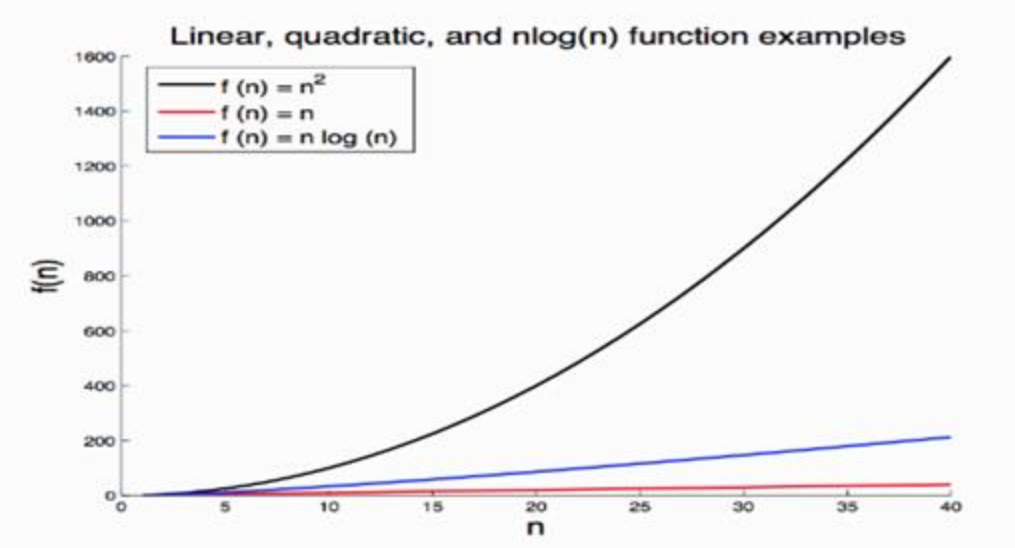
Algorithms?

- The title of the course is Data Structures and **Algorithms**
  - How do we construct a data structure?
  - Once we have a data structure and we are storing data in it, what useful algorithms can we perform?



Algorithm design and analysis

- How does an algorithm scale as data becomes very large?
- We ask questions of algorithms in terms of how they perform as a function of data size (n)



Course Logistics

Lecture – Section 200

- RAMY C250, MWF 01:25 PM - 02:15 PM
- Lecture attendance is expected
  - Students are responsible for knowing anything that is announced in lecture
  - If attendance is poor, we will do attendance quizzes
- I recommend using paper and pencil, or some way of taking notes other than typing
- Class will be theory as well as implementation
  - Pseudo-code for algorithms

Recitation

- Hosted by a TA
- Weekly, 1.25-hour meetings.
- There will be a weekly graded activity. Ask questions about assignments and get extra help.
- 50% for attendance, 50% for activity completion

Communication

- Use Piazza to ask questions
- Can my question be answered by other students?

  Post a public question

- Can my question be answered by the Teaching Assistant or the Course Manager?

  Post a private message for "Instructors" in Piazza

- Is my question a private matter that neither students or anyone from the teaching team can answer?

  Send a private message to me, either via Piazza or email

- Only send an email if you have something very urgent or an emergency (note: a late submission or a missing grade do not count)

Canvas

Course Website

- syllabus
- announcements
- assignments
- quizzes
- office hours
- interview schedulers
- lecture notes
- grades (you should always check that the grades match what you expect)

Accessing the Canvas site:

1. Go to: https://canvas.colorado.edu/
2. Login with your identikey
3. Find this course

Office Hours

TA, instructors, and CA calendars can be found on Canvas

- A dynamic Google Calendar will hold all times and Zoom links
- Please come prepared with questions *after* putting thought into the given problem
- Do not show up and expect to be walked through the assignment step-by-step

Syllabus

The syllabus is like a contract. Everyone is required to become familiar with it. It can be found on Canvas.

Piazza

- Online discussion forum where students can ask questions, answer questions, and explore the topics covered in class.
- NOT a complaint board
- The forum is anonymous to other students, but it is NOT anonymous to the instructors.
- Inappropriate content will be removed and violators will be banned.
- Students should not depend on getting last minute questions answered here. We cannot require our course staff to work weekends (sometimes they do, but we do not provide a 24hr support service ☺).

Programming pre-requisites

- You should be proficient in a programming language, preferably C++
- Learning a new language is part of computer science
- Resources for learning C++
  - Online C++ resources
  - Check out links we have shared on Piazza

Textbook

Hoenigman, R. 2015. *Visualizing Data Structures*. Lulu Press.

* Available for free in eBook format (find it on Canvas)

Grading Criteria and Points Breakdown

Task	Percentage
Weekly Quizzes	10%
Recitation	10%
Homework	25%
Exams (3 exams, 15% each)	45%
Project	10%

Recitation this week

- C++ review
- Coding environment
- Familiarization with the coding assignment framework

Coding Environment

- We will ask that you use the coding environment provided free with your university account at https://coding.csel.io/
- If you are familiar with VS Code it is available here
- You are free to install VS Code + Compiler locally, but we will not guarantee to be able to help you with this

Weekly Coding Assignments

- You will be asked to implement a data structure and some associated functions.
- Unlike in CSCI 1300, we will use GitHub to distribute the assignments.
- Each assignment will come with a set of test cases written in the Google Test Suite. Your job will be to write code that passes those test cases.
- You will begin each assignment by accepting it from the GitHub Classroom
- A private repository will automatically be created for you. Only Instructors and TAs will be able to access it.
- You will be able to compile and run your test cases locally
- **It is good practice to commit/push your code frequently, so you do not lose any work .**
- **In order to submit your assignment, you will paste your repository link back into Canvas which will trigger the autograder.**

A few words about myself

Professional:

- Have been a part of the Comp Sci dept for 7 years
- I also serve as one of the Co-Chairs for Undergraduate Education in the department
- My professional path began with Electrical Engineering
- Started programming in C++ while working on my M.Sc. thesis project at the Colorado School of Mines
- Worked as a firmware engineer in the digital storage industry
- Love being back in academia and working with diverse groups of students

Play:

- Things I enjoy in my personal life:
  - traveling
  - outdoors: skiing, biking
  - good food and coffee
  - reading books