CSC 211: Computer Programming

Introduction

Michael Conti

Department of Computer Science and Statistics
University of Rhode Island

Summer 2024

Team

- Instructors
  - Michael Conti
- Undergraduate Courses
  - URI 101, **CSC 211**, CSC 491 , CSF 202, CSF 432, CSF 434
- Graduate Courses
  - CSF 534
  - CSF 590

Team

- Undergraduate TAs
  - Yemi
  - Ilanna

Lecture and Lab

- Lectures
  - Tu/ Wed /Thurs | 1:00p - 2:15p | @ Library 166
- Format for first two weeks
  - Lecture, lecture, lecture
- Format for rest of semester
  - Lecture, lecture, lab

Discussion Sections

- Discussion Sections (80% == +5 on final exam)
- None first week of class

Day	Staff Member	Time	Location
Tuesday	Yemi, Ilanna	9a - 10a	Tyler 055
Thursday	Yemi, Ilanna	9a - 10a	Tyler 055

Office Hours

Office Hours Schedule
Location: Tyler 3rd Floor Lounge

- None first week of class

Day	Staff Member	Time	Location
Tuesday	Yemi, Ilanna	10a - 12p	3rd Floor Lounge
Wednesday	Yemi, Ilanna	11a - 12p	3rd Floor Lounge
Thursday	Yemi, Ilanna	10a - 12p	3rd Floor Lounge

CSC 211?

- Introduction to Programming
  - focus on **problem solving**

Language of choice: C/C++. Prior programming experience is not strictly necessary.

- Computer Programming
  - Basic CS constructs, OOP (classes, objects, inheritance, polymorphism, encapsulation)
- Review of elementary CS techniques, algorithms and data structures
  - e.g. recursion, sorting, stack/heap

Prerequisites: **CSC 106** or major in Computer Engineering

Tentative Schedule

Week	Topics	Resources
Week 1	Lecture - Introduction to 211, Computer Systems, Programming Languages Lab - Hello 211, IDE Setup, Basic Shell Commands Reading - Savitch, Chapter 1	Lecture Slides
Week 2	Lecture - Problems/Algorithms/Programs, History of C++, The Compiler Lecture - C++ Basics, Input/Output, Data Types, Expressions Lab - Algorithms, Problem Design, Pseudo-code Exercises Reading - Savitch, Chapter 2	Lecture Slides Lecture Slides Lab Assignment00
Week 3	Lecture - Number Systems, Further look into DataTypes Lecture - Expressions, Selection Statements Assignment - Assignment 0 Lab - Programming Exercises (branching) Reading- Savitch, Chapter 3	Lecture Slides Lecture Slides Lab
Week 4	Lecture - Introduction to Loops (for) Lecture - Loops (while, do while) and Nested Loops (examples) Assignment - Assignment 1 Lab - Programming Exercises (loops and nested loops) Reading- Savitch, Chapter 3	Lecture Slides Lecture Slides Lab Assignment01

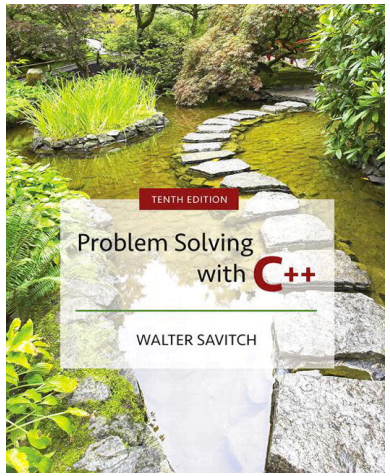
Tentative Schedule

Week 5	Lecture - Functions Lecture -Scope of Variables, Parameter passing, Call Stack Lab - Using the Debugger, Programming Exercises (functions) Reading - Savitch, Chapter 4 Reading - Savitch, Chapter 5	Lecture Slides Lecture Slides Lab
Week 6	Lecture - Arrays, Arrays and Functions **Exam - Midterm Exam (weeks 1 to 5)** Lab - Strings (C style strings and string objects) Assignment - Assignment 2 Reading - Savitch, Chapter 7 Reading - Savitch, Chapter 8	Lecture Slides Lecture Slides Lab Assignment02
Week 7	Lecture - Basic Sorting Lab - Basic sorting algorithms	Lecture Slides Lecture Slides Lab
Week 8	Lecture - Multidimensional Arrays Lecture - Pointers Lab - Programming Exercises (pointers) Reading - Savitch, Chapter 9	Lecture Slides Lecture Slides Lab

Tentative Schedule

Week 9	Assignment - Assignment 3 Lecture - Recursion and Examples Lecture - Recursion (cont.) and Examples Lab - Programming Exercises (tracing recursion, drawing recursion trees)	Lecture Slides Lecture Slides Lab
Week 10	Lecture - Binary Search Lecture - Advanced Recursion (Backtracking), Structs Lab - Advanced Recursive Problems	Lecture Slides Lecture Slides Lab
Week 11	Assignment - Assignment 4 Lecture - Classes, Data Members and Methods (Encapsulation) **Exam - Midterm Exam (weeks 6 to 10)** Lab - Implementing Classes (source/headers), Arrays and Objects	Lecture Slides Lecture Slides Lab
Week 12	Lecture - Constructors Lecture - Dynamic Memory Allocation, Destructors Lab - Developing a string Class (overloaded operators and copy constructors) Reading - Savitch, Chapter 14	Lecture Slides Lecture Slides Lab
Week 13	Lecture - Class Inheritance Lecture - Singly Linked Lists Lab - STL Containers, read/write from files, and CLAs Reading - Savitch, Chapter 15	Lecture Slides Lecture Slides Lab
Week 14	**Exam - Final Exam (cumulative with focus on weeks 11 to 14)**	None

Required textbook



No need to buy

MyLab Programming

amazon

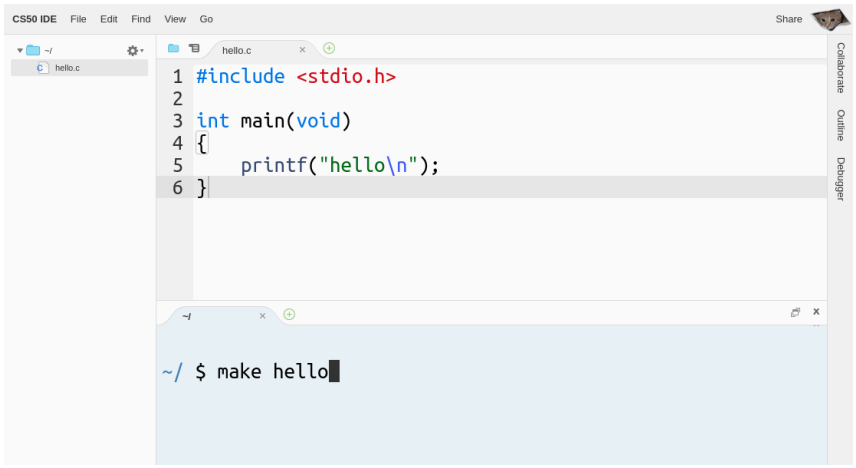
Pearson

C/C++?

Recommended Tools

- although you are free to use **any IDE** on **any platform**, we will grade all assignments using **g++ on a Linux machine**
- Visual Studio Code for CS50 IDE is **a good option**!
- alternatives:
  - vim, g++, gdb (running on Linux)
  - **VSCode ~ best alternative option**

CS50 IDE



Grading (subject to change)

- Assignments
  - ~5 programming assignments (25%)
  - Lab attendance (10%)
  - Weekly Programming Challenges (10%)
- Exams
  - 2 exams (30%)
  - 1 final exam (25%)

All exams are based on textbook chapters and lecture materials

Programming Assignments

- Discussions and collaboration are allowed, however you **must write your own code**
- All programming assignments will be **automatically** graded on Gradescope
  - Late submissions are **NOT** accepted
  - Infinite submissions

Plagiarism?

- just **don't do it**
- if you get caught (chances are very high), your name(s) will be immediately reported for further sanctions

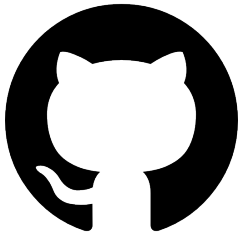
Plagiarism

File 1	File 2	Lines Matched
spring-19/submission_15826983/functions.cpp (89%)	spring-19/submission_15857164/functions.cpp (94%)	167
spring-19/submission_15858590/functions.cpp (47%)	spring-19/submission_15860745/functions.cpp (88%)	161
spring-19/submission_15845050/functions.cpp (52%)	spring-19/submission_15859763/functions.cpp (64%)	151
spring-19/submission_15845050/functions.cpp (50%)	spring-19/submission_15854554/functions.cpp (42%)	122
spring-18/submission_6696725/functions.cc (48%)	spring-18/submission_6706969/functions.cc (66%)	91
fall-18/submission_9926606/functions.cpp (72%)	spring-19/submission_15843429/functions.cpp (61%)	128
spring-18/submission_6697832/functions.cc (56%)	spring-18/submission_6706969/functions.cc (60%)	117
spring-18/submission_6696725/functions.cc (44%)	spring-18/submission_6701298/functions.cc (44%)	85
spring-19/submission_15849001/functions.cpp (66%)	spring-19/submission_15856189/functions.cpp (73%)	189
fall-18/submission_9867275/functions.cpp (89%)	spring-19/submission_15860062/functions.cpp (65%)	179
spring-19/submission_15861942/functions.cpp (87%)	spring-19/submission_15863011/functions.cpp (85%)	132
spring-19/submission_15856189/functions.cpp (68%)	spring-19/submission_15857164/functions.cpp (67%)	122
fall-18/submission_9933156/functions.cpp (73%)	spring-19/submission_15857316/functions.cpp (49%)	128
spring-19/submission_15826983/functions.cpp (58%)	spring-19/submission_15856189/functions.cpp (61%)	105
spring-18/submission_6712472/functions.cc (67%)	spring-18/submission_6712960/functions.cc (64%)	149
spring-18/submission_6701298/functions.cc (35%)	spring-18/submission_6706969/functions.cc (48%)	58
spring-18/submission_6696725/functions.cc (35%)	spring-18/submission_6697832/functions.cc (44%)	92
spring-19/submission_15861491/functions.cpp (65%)	spring-19/submission_15861942/functions.cpp (74%)	150
spring-19/submission_15856342/functions.cpp (42%)	spring-19/submission_15858250/functions.cpp (45%)	112
spring-19/submission_15862600/functions.cpp (66%)	spring-19/submission_15863011/functions.cpp (71%)	96
spring-19/submission_15861491/functions.cpp (64%)	spring-19/submission_15863011/functions.cpp (71%)	138
spring-19/submission_15861809/functions.cpp (59%)	spring-19/submission_15862609/functions.cpp (46%)	116
fall-18/submission_9936095/functions.cpp (61%)	spring-18/submission_6700982/functions.cc (42%)	67
spring-19/submission_15861942/functions.cpp (68%)	spring-19/submission_15862600/functions.cpp (62%)	86
spring-19/submission_15849001/functions.cpp (49%)	spring-19/submission_15857164/functions.cpp (54%)	155
spring-19/submission_15857164/functions.cpp (53%)	spring-19/submission_15862216/functions.cpp (53%)	125
spring-19/submission_15862555/functions.cpp (57%)	spring-19/submission_15862609/functions.cpp (44%)	107
fall-18/submission_9856744/functions.cpp (61%)	spring-19/submission_15827542/functions.cpp (47%)	149

Example

Where are assignments / labs hosted?

- Github
  - https://github.com/mikeconti/csc211-spring2024
- Piazza
  - Resources
    - Course Github
    - Assignments
    - Labs
    - Lecture slides
    - Code



How to succeed in this class?

- I do not spend time taking attendance … but …
  - students skipping lectures will (very) likely **fail** this class
- **Organize** your time
  - lectures, labs, discussion sections, programming assignments, exams
- **Participate** and think critically
  - ask questions (lectures, labs, discussion sections, office hours, Piazza)
- Start assignments **early**
  - programming and debugging takes time (especially for all/nothing grading)
  - **avoid** copying/pasting or google'ing answers by all means

How to succeed in this class?

- Skim related textbook section/chapter before coming to lecture
  - read thoroughly afterwards and solve problems/exercises
- Do not expect assignment solutions from the TAs
- Think before you code
  - write pseudocode on paper
- Write code incrementally
  - write, compile, test frequently

Need help?

- Come to **Office Hours**
- Post questions on **Piazza**
  - answer questions, share information
- Attend discussion sessions
- Last minute Piazza post?
  - Your lack of planning does not constitute an emergency on my part

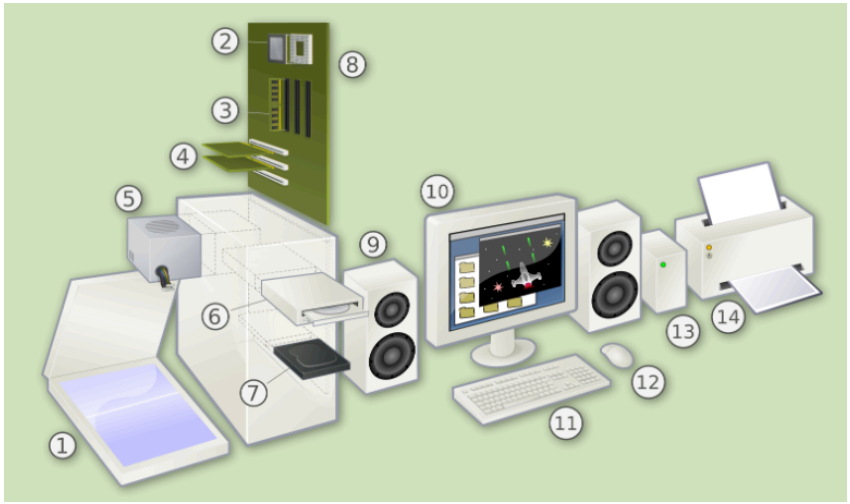
piazza

Final Thoughts on CSC 211 intro

- Understand what motivates you
- Don't succeed for me, succeed for you
- Everyone has a different starting place
  - Determination is the **most important** predictor for success.
- Your code matters
  - Great power comes with great responsibility

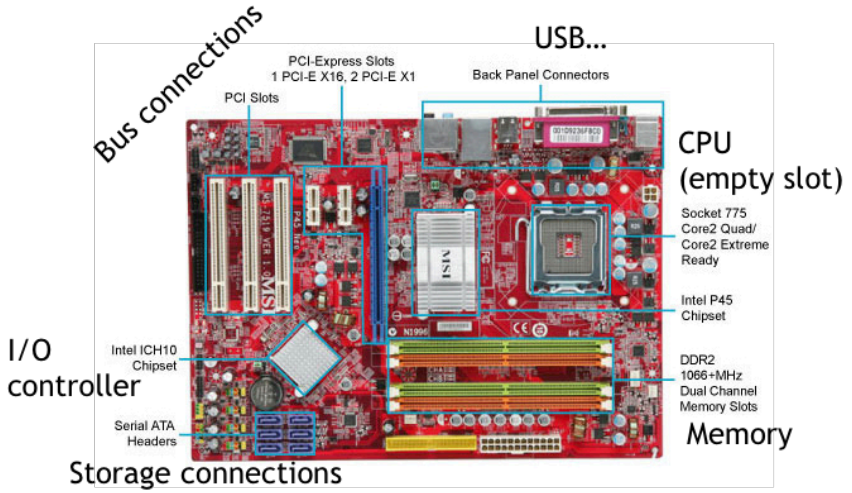
Computer Systems

Computer Components



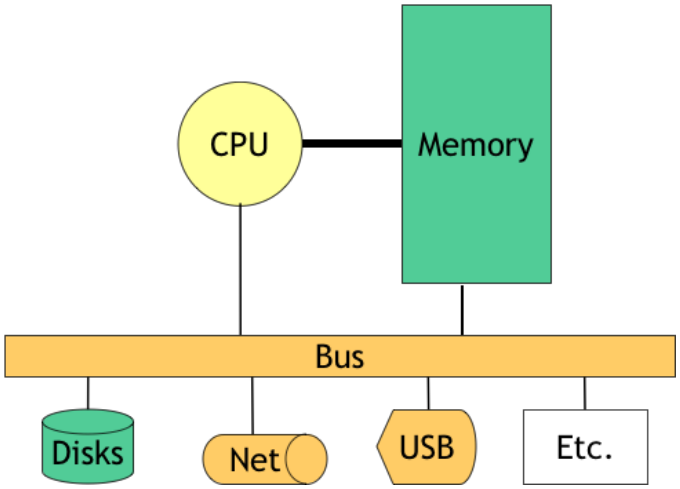
https://bjc.edc.org/bjc-r/cur/programming/6-computers/1-abstraction/07-digital-components.html

Inside a typical computer/laptop



from: CSE 351, University of Washington

Von Neumann model



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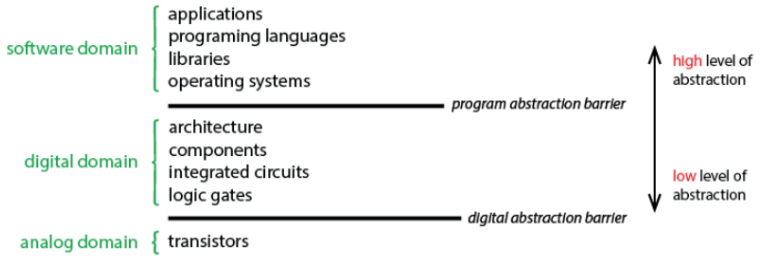
Abstraction Layers

"the process of removing physical, spatial, or temporal details or attributes in the study of objects or systems in order to focus attention on details of higher importance" [wikipedia]

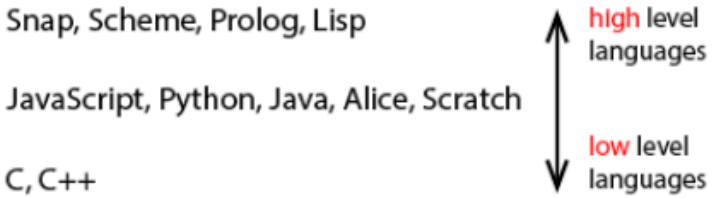


Different people might draw this diagram slightly differently, so don't try to memorize all the levels. The key abstraction levels to remember are software, digital computer hardware, and underlying analog circuit components.

https://bjc.edc.org/bjc-r/cur/programming/6-computers/1-abstraction/01-abstraction.html

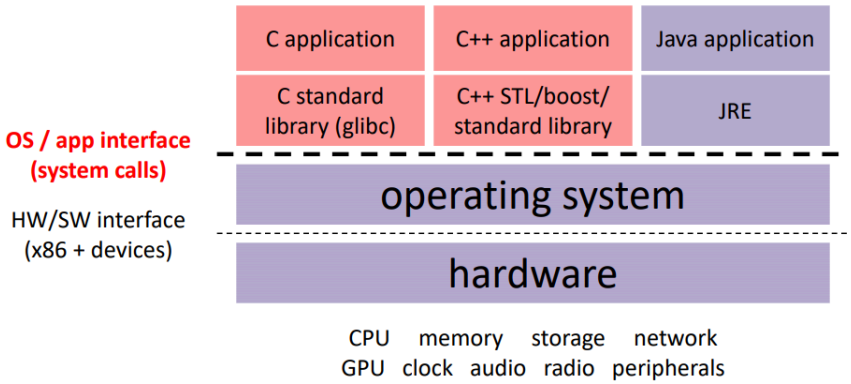
High-Level and Low-Level Languages

A *high-level language* (like Snap*!* or Scheme) includes many built-in abstractions that make it easier to focus on the problem you want to solve rather than on how computer hardware works. A *low-level language* (like C) has fewer abstractions, requiring you to know a lot about your computer's architecture to write a program.



https://bjc.edc.org/bjc-r/cur/programming/6-computers/1-abstraction/03-software-languages.html

Programming applications



from: CSE 333, University of Washington

Compiling C code

```
void sumstore(int x, int y,
              int* dest) {
  *dest = x + y;
}
```

C source file (sumstore.c)

C compiler (gcc -S)

```
sumstore:
        addl    %edi, %esi
        movl    %esi, (%rdx)
        ret
```

Assembly file (sumstore.s)

Assembler (gcc -c or as)

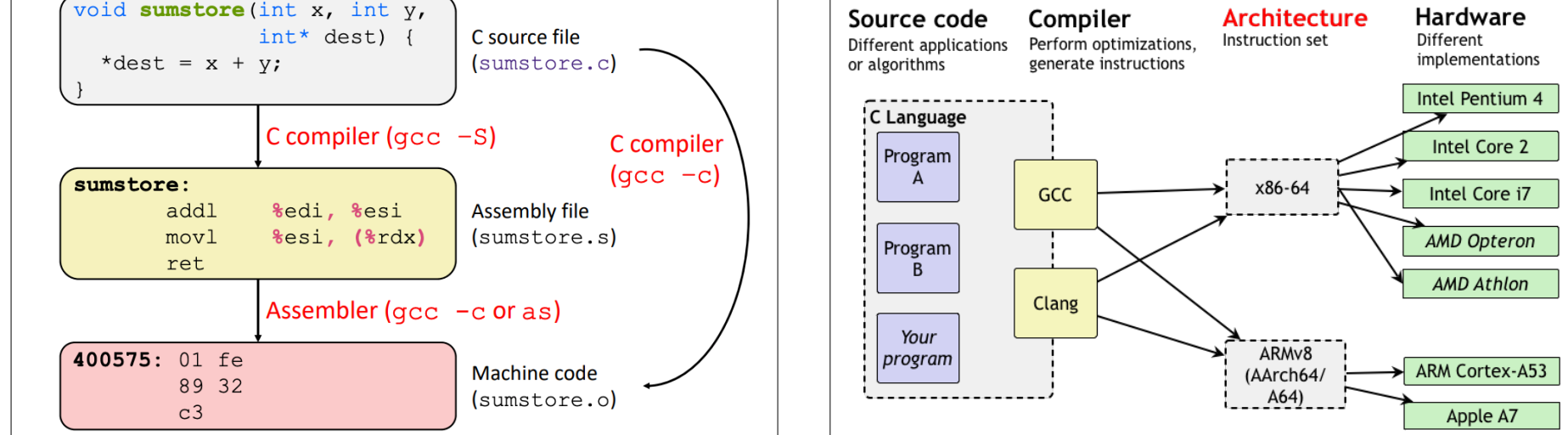
```
400575: 01 fe
        89 32
        c3
```

Machine code (sumstore.o)

C compiler (gcc -c)

from: CSE 333, University of Washington

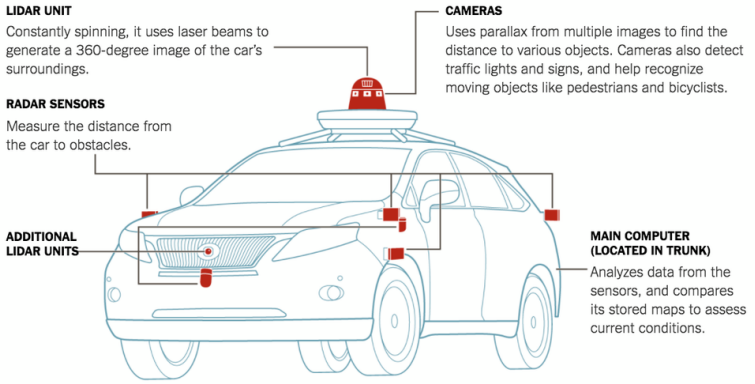
Multiple targets



from: CSE 351, University of Washington

Devices everywhere

Devices everywhere



https://www.nytimes.com/2018/03/19/technology/how-driverless-cars-work.html

//TODOs

- A00 is out ~ paper on history of CS
- Groups assigned (4 - 5 members)

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