CSC 211: Object Oriented Programming

Introduction

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Original design and development by Dr. Marco Alvarez

Team

- Instructors
  - Michael Conti
- Graduate TAs
  - Christian Esteves
- Undergraduate TAs
  - John Bertsch
  - Rodrigo Pimentel

Welcome !

- Lectures
  - TR 2:00 - 3:15p @ White 113
- Labs
  - M 3:00p - 4:45p @ Engineering 045
  - T 3:30p - 5:15p @ Engineering 045
- Discussion Sections
  - @ TBA
- Office Hours
  - TBA

CSC 211?

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

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

- Introduction to Object Oriented Programming
  - classes, objects, inheritance
- Review of elementary CS techniques, algorithms and data structures
  - e.g. recursion, sorting, linked lists

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

Tentative Schedule

Tentative Course Outline:

> The weekly schedule is subject to change per instructor discretion.

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
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

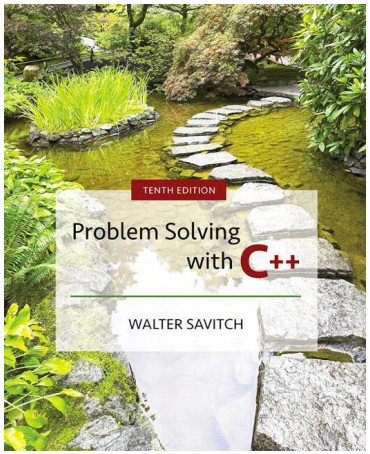
Tentative Schedule

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
Week 7	Spring Break	None
Week 8	Lecture - Basic Sorting Lab - Basic sorting algorithms	Lecture Slides Lecture Slides Lab
Week 9	Lecture - Multidimensional Arrays Lecture - Pointers Lab - Programming Exercises (pointers) Reading - Savitch, Chapter 9	Lecture Slides Lecture Slides Lab
Week 10	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

Tentative Schedule

Week 11	Lecture - Binary Search Lecture - Advanced Recursion (Backtracking), Structs Lab - Advanced Recursive Problems	Lecture Slides Lecture Slides Lab
Week 12	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 13	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 14	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 15	Exam - Final Exam (cumulative with focus on weeks 11 to 15)	None

Required textbook



No need to buy

MyLab Programming

URI CAMPUS STORE
THE UNIVERSITY OF RHODE ISLAND
DIVISION OF STUDENT AFFAIRS

amazon

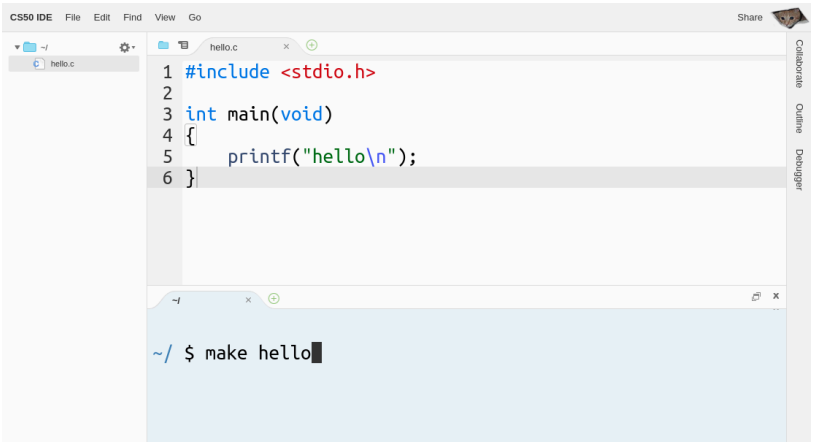
Pearson

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**
- CS50 IDE is strongly **recommended** !
- alternatives:
  - vim, g++, gdb (running on Linux)
  - VSCode

CS50 IDE



Grading (subject to change)

- Assignments
  - ~8 programming assignments (25%)
  - lab attendance (5%)
- Exams
  - 2 exams (40%)
  - 1 final exam (30%)

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
  - no less than 7 days to complete
  - late submissions are **NOT** accepted

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

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

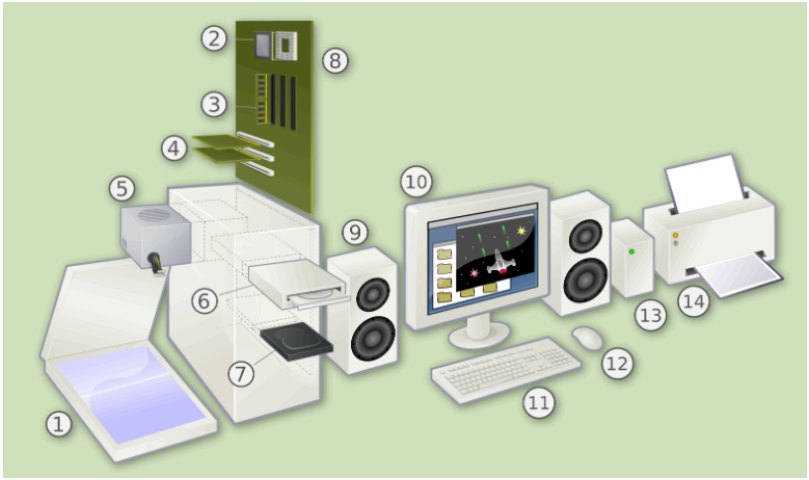
Need help?

- Come to **Office Hours**
- Post questions on **Piazza**
  - answer questions, share information

piazza

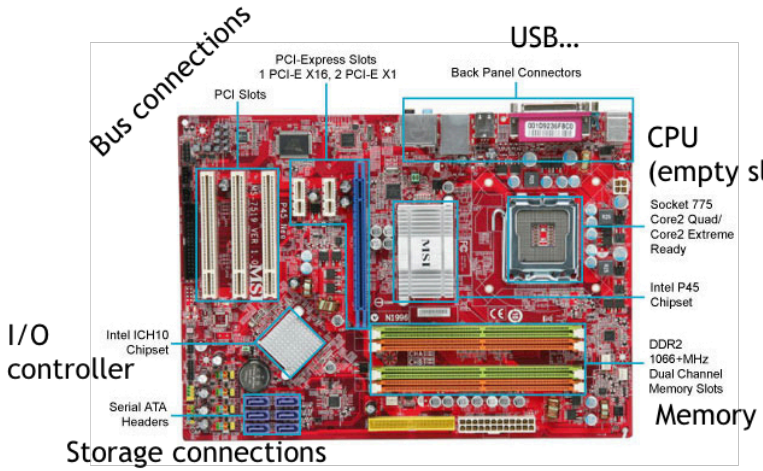
Computer Systems

Computer Components



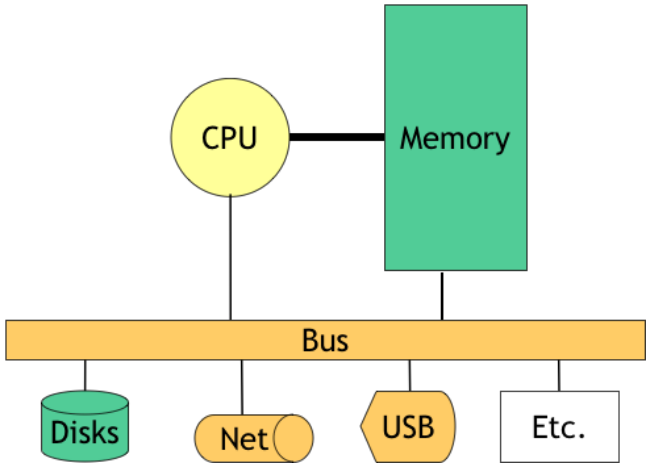
https://bjc.edc.org/bjc-r/cur/programming/6-computers/1-abstraction/07-digital-components.html

Inside a typical computer/laptop



from: CSE 351, University of Washington

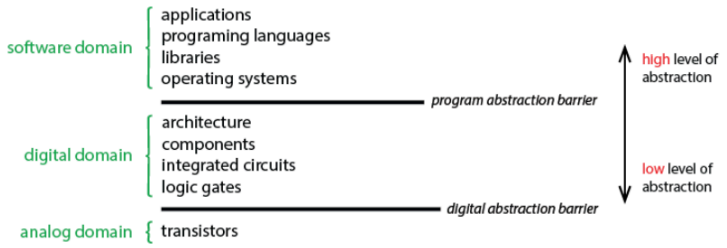
Von Neumann model



from: CSE 351, University of Washington

Abstraction Layers

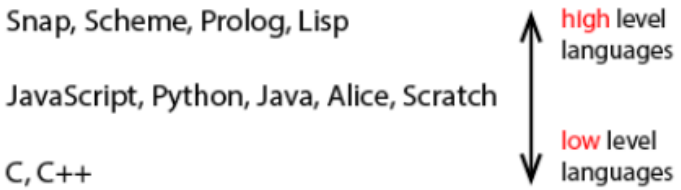
"the process of removing physical, spatial, or temporal details or attributes in the study of objects or systems in order to focus attention on details of higher importance" [wikipedia]



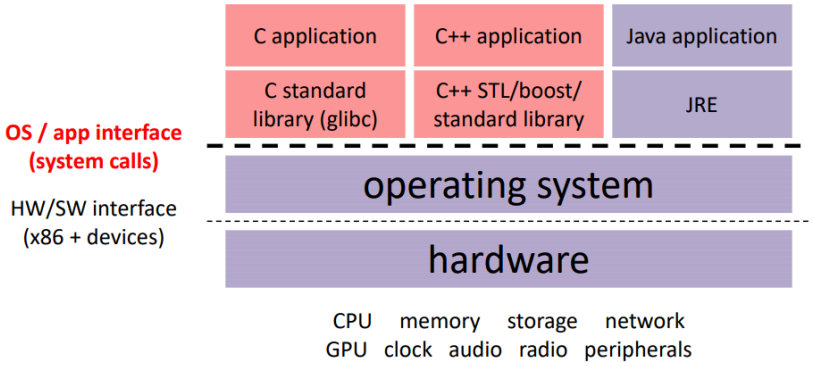
Different people might draw this diagram slightly differently, so don't try to memorize all the levels. The key abstraction levels to remember are software, digital computer hardware, and underlying analog circuit components.

High-Level and Low-Level Languages

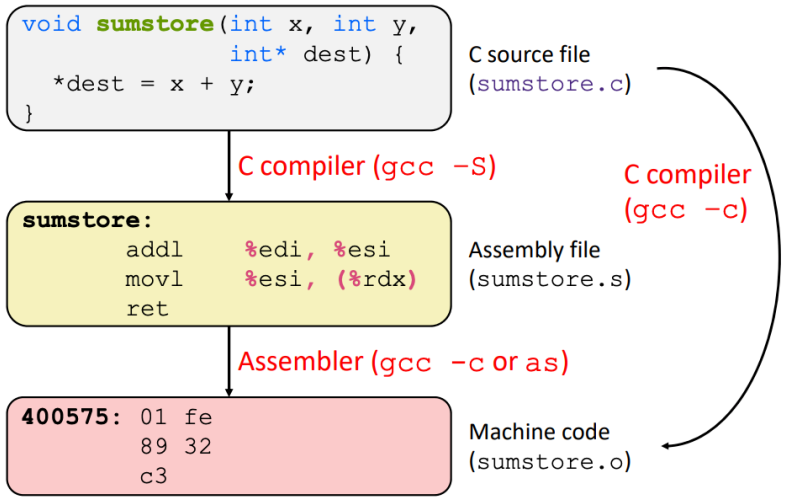
A *high-level language* (like Snap*!* or Scheme) includes many built-in abstractions that make it easier to focus on the problem you want to solve rather than on how computer hardware works. A *low-level language* (like C) has fewer abstractions, requiring you to know a lot about your computer's architecture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



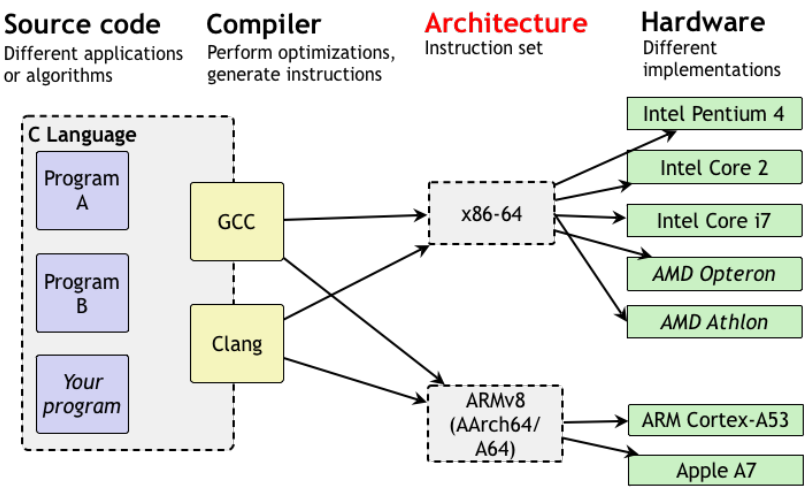
Programming applications



Compiling C code



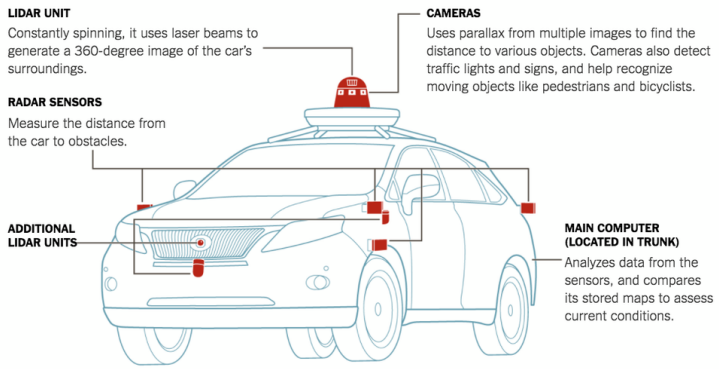
Multiple targets



from: CSE 351, University of Washington

Devices everywhere

Devices everywhere



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