

# Lecture 1: Introduction

CMPE 120: Computer Organization and Architecture

Olivia Weng

# Staff

- Instructor: Olivia Weng
  - Assistant Professor in Computer Engineering
  - Office hours: TBA
  
- TAs:
  - Shinika Balasundar
  - Vikasni Kalahasthi

## Education

- PhD in Computer Science
- MS in Computer Science

UC San Diego

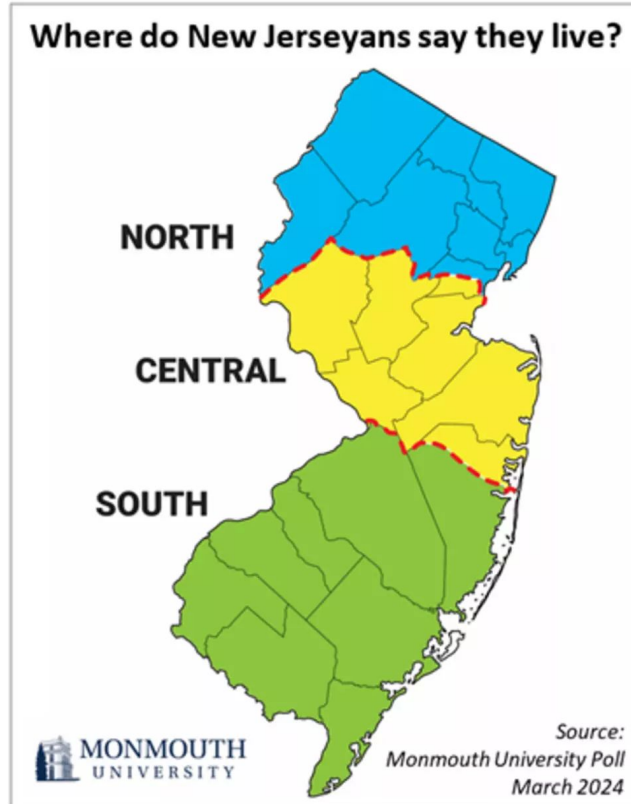
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- BS in Computer Science



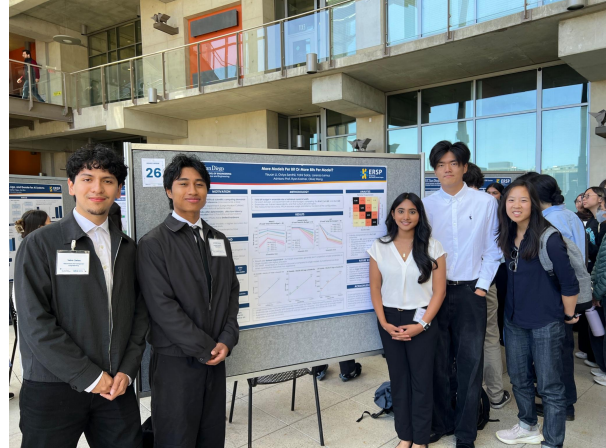
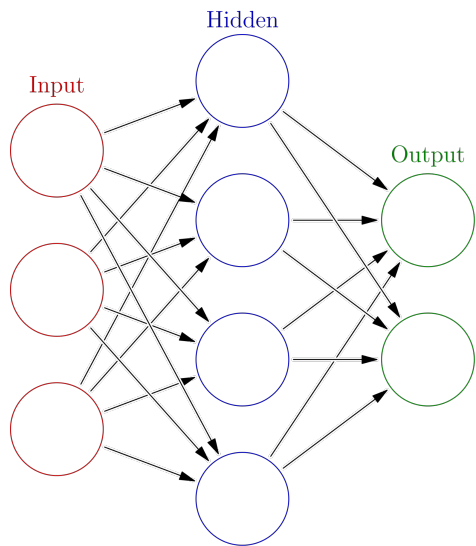
THE UNIVERSITY OF  
CHICAGO

# Where I am from



# Research interests

- How to run small AI models fast on cool hardware



# Fun things!



# Introduce yourself to your classmates

1. What is your **name**?
2. **Where** are you from?
3. What is your **major** (if any) and **year in college**?
4. Why are you **interested** in taking this class?
5. What is **one fun thing** about you?

How does a program **run** on a computer?

# How does a program **run** on a computer?

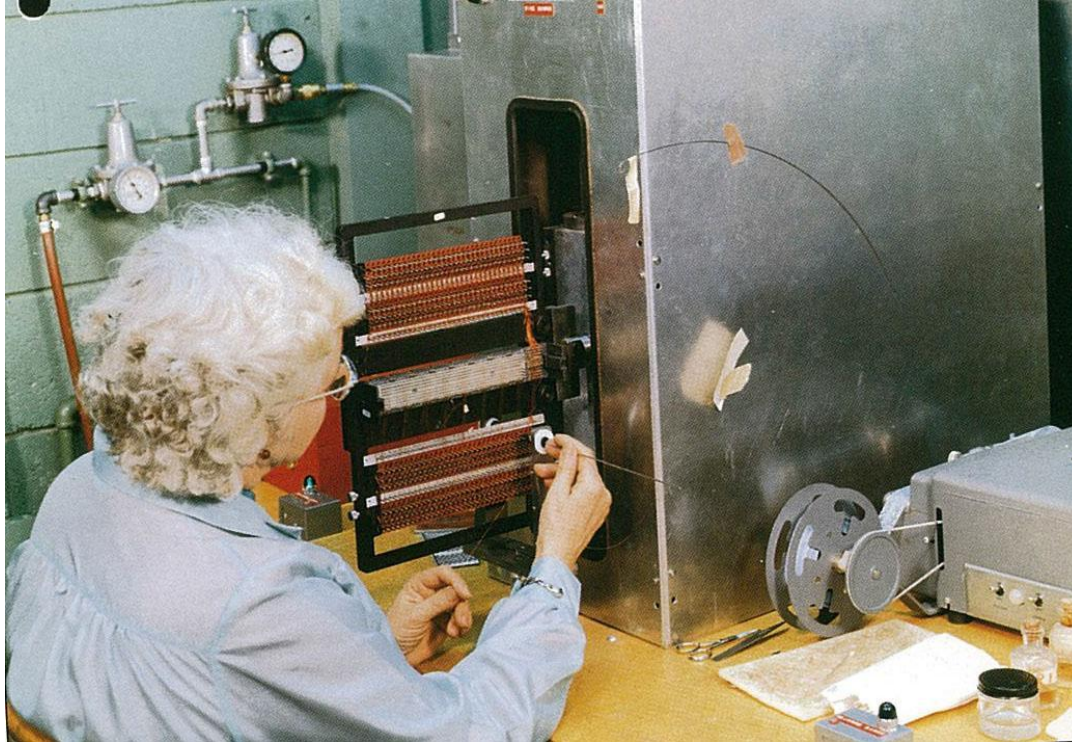


A diagram illustrating the layers of computer software and hardware. It consists of two rectangular boxes stacked vertically. The top box is light gray and labeled 'Application'. The bottom box is light blue and labeled 'Physics'. The boxes are separated by a large white space, suggesting a hierarchy or stack of layers.

Application

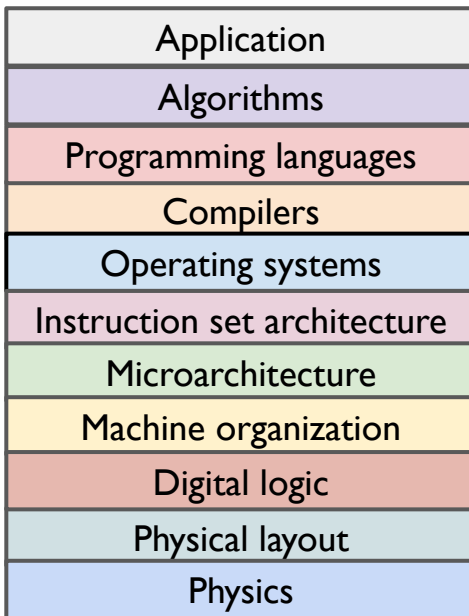
Physics

# Dealing with physics straight up...



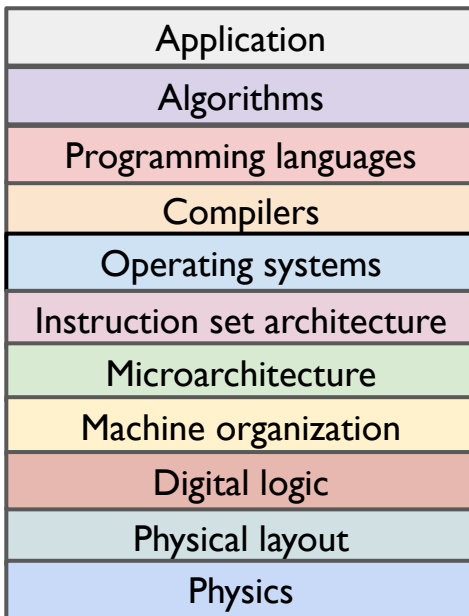
Ref: <https://www.righto.com/2019/07/software-woven-into-wire-core-rope-and.html>

# How does a program **run** on a computer?



# How does a program **run** on a computer?

- Abstraction allows us to reason about complex things in a simpler way
  - CS levels of abstraction



CMPE 120 lives here

# What is computer architecture?

- Computer architecture = Instruction set architecture + Machine organization

Why take CMPE 120 and learn computer architecture?

# Why take CMPE 120 and learn computer architecture?

- Learn how computers run programs
  - Even multiple programs at a time
- Supplement your programming skills with computer architecture knowledge
  - Understand why your program is slow...
  - Learn how to make your programs run fast!
- Take a step from being a programmer to being an engineer

# Outline

- Logistics
- What happens when you run a program

# Testing out iClicker

- Sign up at <https://join.iclicker.com/AJVW>



How **excited** are you about the class?

A. Super excited!

B. A little excited

C. Not that excited

D. Not at all excited

Answer with iClicker

How **nervous** are you about the class?

A. Super nervous!

B. A little nervous

C. Not that nervous

D. Not at all nervous

Answer with iClicker

How are you feeling right now?

Answer with iClicker

# Class Website / Syllabus

- <https://www.oliviaweng.com/classes/2026/fall/cmpe120/>



# Course components

- Textbook

- Dive into Systems
- Computer Organization and Design RISC-V Edition :The Hardware Software Interface

- Homework

- 6 homework assignments (includes subsequent in-class quiz for programming assignments)
- Final homework grade: min(in-class quiz, programming assignment grade)

# Course components

- Exams

- Midterm: [in-class](#) Tuesday, October 13th
- Final
  - Sec 01: Thursday, December 10th, 10:45am - 12:45pm
  - Sec 02: Tuesday, December 15th, 1 - 3pm

# Course components

- Participation

- iClicker
- If you receive  $\geq 70\%$  of the participation points, it will be rounded up to 100%

- Check-in

- Talk to me for 15min! Sign up [here](#)

# Grading breakdown

- Homework: 23%
- Midterm: 30%
- Final: 44%
- Class participation: 1%
- Check-in: 1%
- Professionalism: 1%

# How to Pass CMPE 120

- Participate in lecture and office hours
- Be able to do the **homework** on your own
  - The **in-class quizzes** will be easy if you do the homework **yourself**
- The **exams** will be similar to the **iClicker questions solved in-class**

# Academic Integrity & Honesty

- Cheating will be taken **very seriously**
- Examples:
  - Not cheating:
    - Discussing homework in groups, with your hands on your own keyboard, writing your own program yourself
    - Looking at lectures, practice problems & solutions, etc from “other CMPE 120’s”
  - Cheating:
    - Getting a walk-through from someone who has already done the homework
    - Looking at someone else’s completed work (even “just to check”)
    - Receiving, providing, or soliciting assistance from another student during an exam
- Consequences
  - Negative 100% on the assignment where you are caught

# Logistics

- HW0 released
  - Sign the academic integrity & honesty pledge and upload to Gradescope via Canvas

Time to start teaching

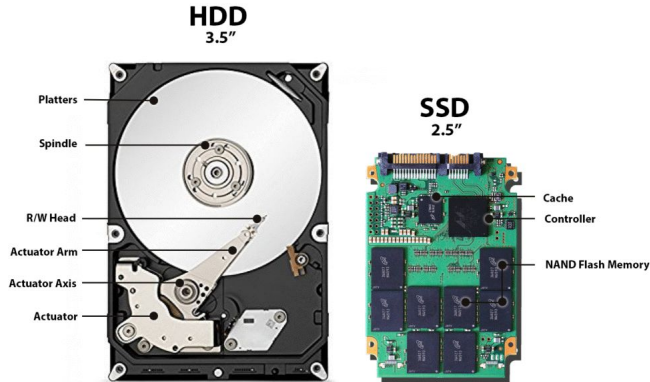
# What happens when you run a program?

- Hardware is involved?
  - CPU? RAM? Disk??

# What happens when you run a **program**?

- Hardware is involved?
  - CPU? RAM? Disk??

Disk



RAM



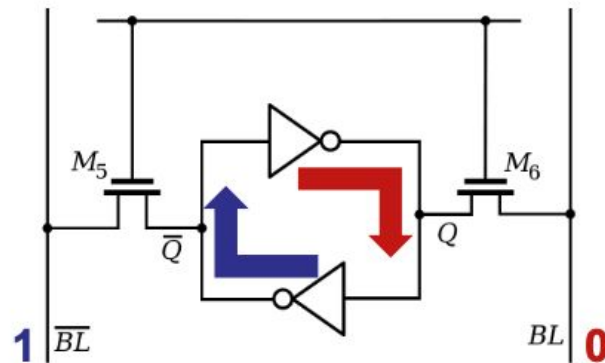
CPU



How do we **store** a **string** of **characters** inside a computer?

# How do computers store characters?

- SRAM cell
  - SRAM = Static random access memory
  - Stores state of a **single bit: 0 or 1**
    - High state: 1
    - Low state: 0
- Why?
  - **Cheap**: made of sand (silicon)
  - **Fast**: read/write billions of times per second
  - **Accurate**: nearly always correctly returns the stored bit
  - **Small**: fit billions inside a computer chip



How can we use bits 0/1 to represent characters?