

CSCI 210: Computer Architecture

Lecture 1: Introduction

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Oberlin College

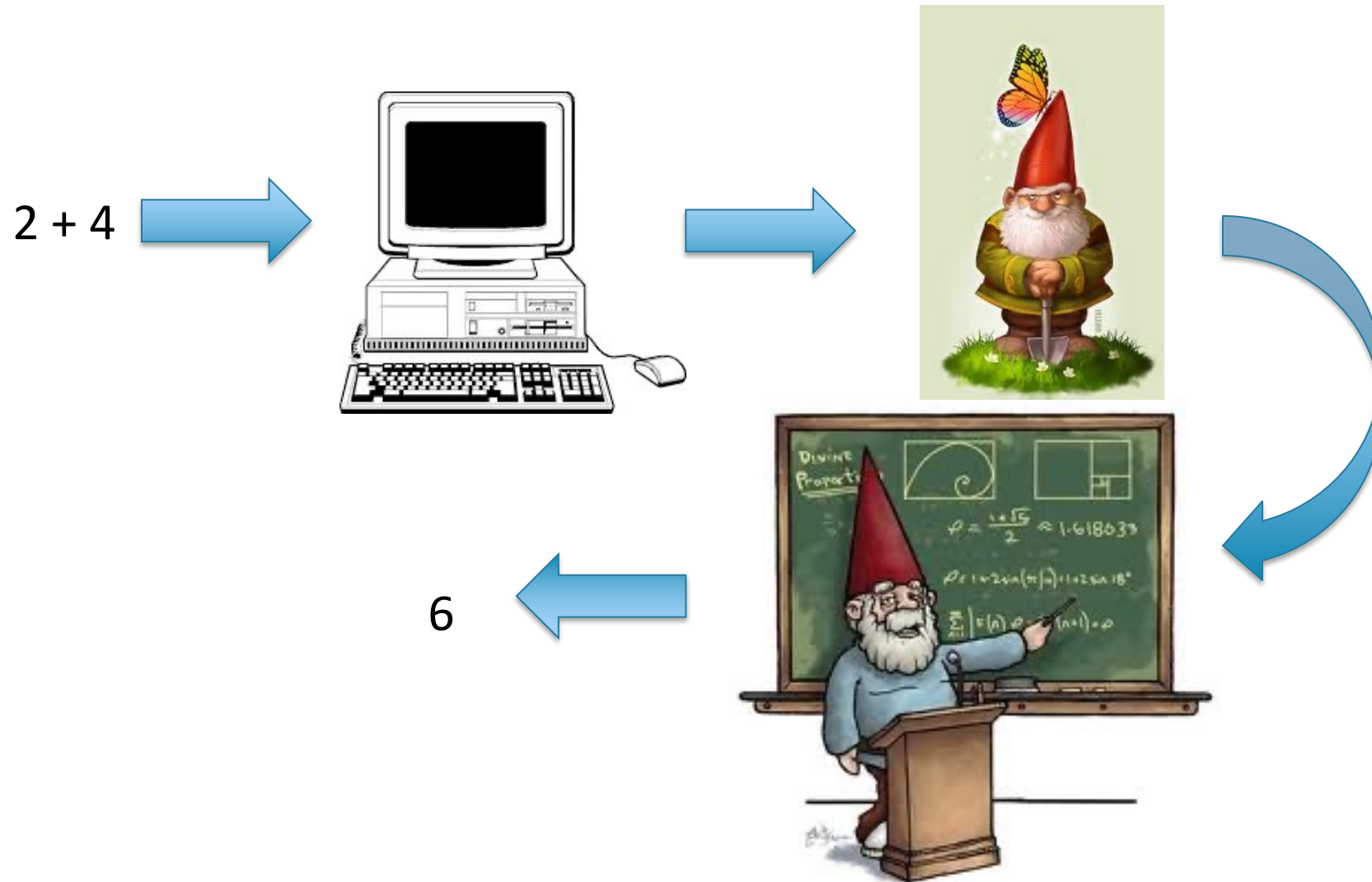
Feb 18, 2022

Slides by Cynthia Taylor

Announcements

- Office Hours:
 - Tuesday: 13:30–14:30
 - Friday: 13:30–14:30
- Course website:
<https://checkoway.net/teaching/cs210/2022-spring/>
- Problem Set 0 due on Friday! It's on the website

Previous Conceptions of How Computers Work



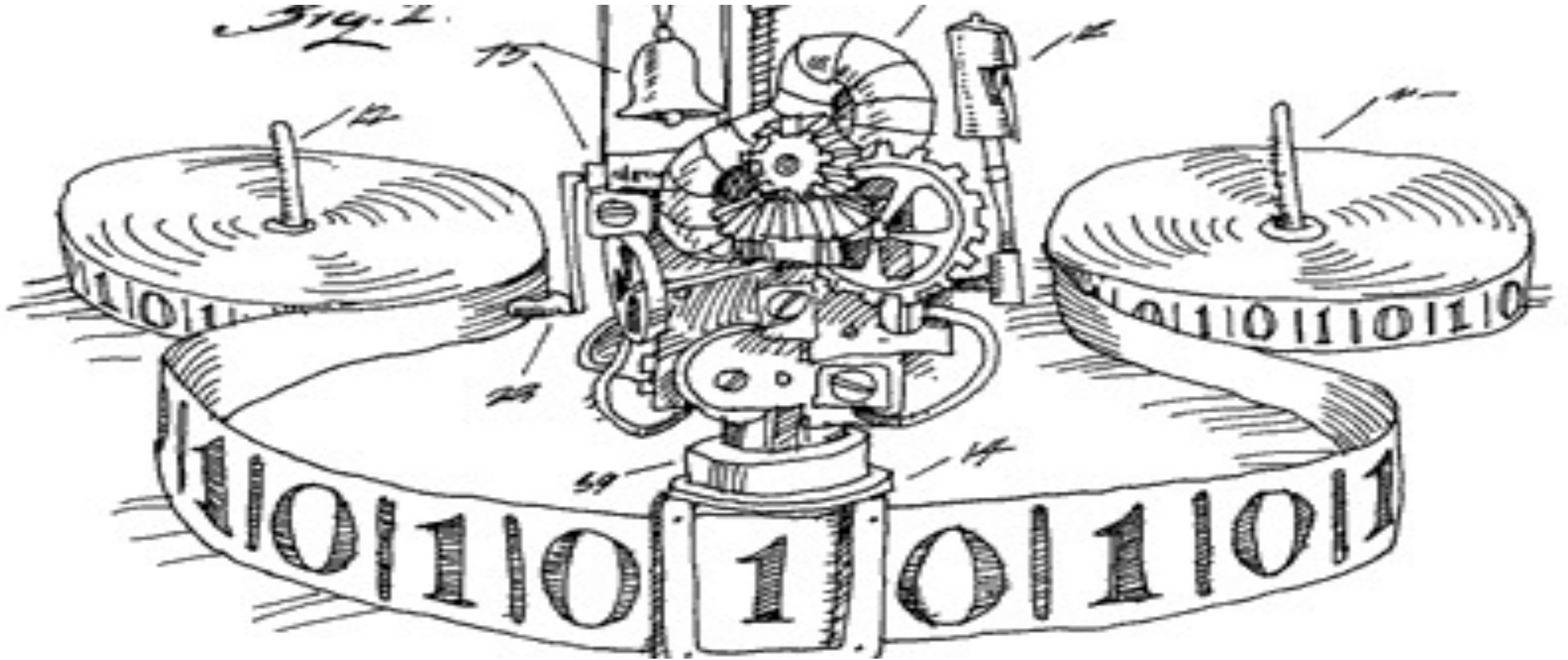
What is a computer?



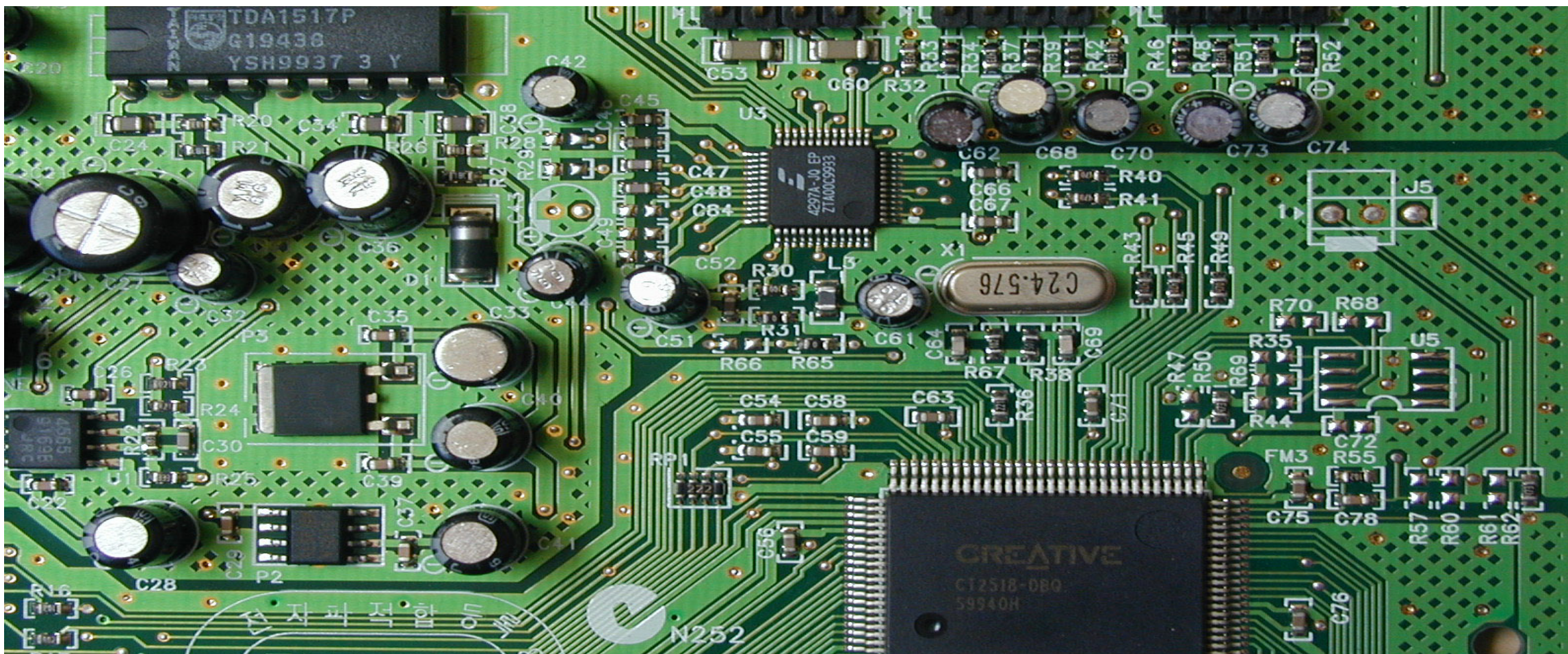
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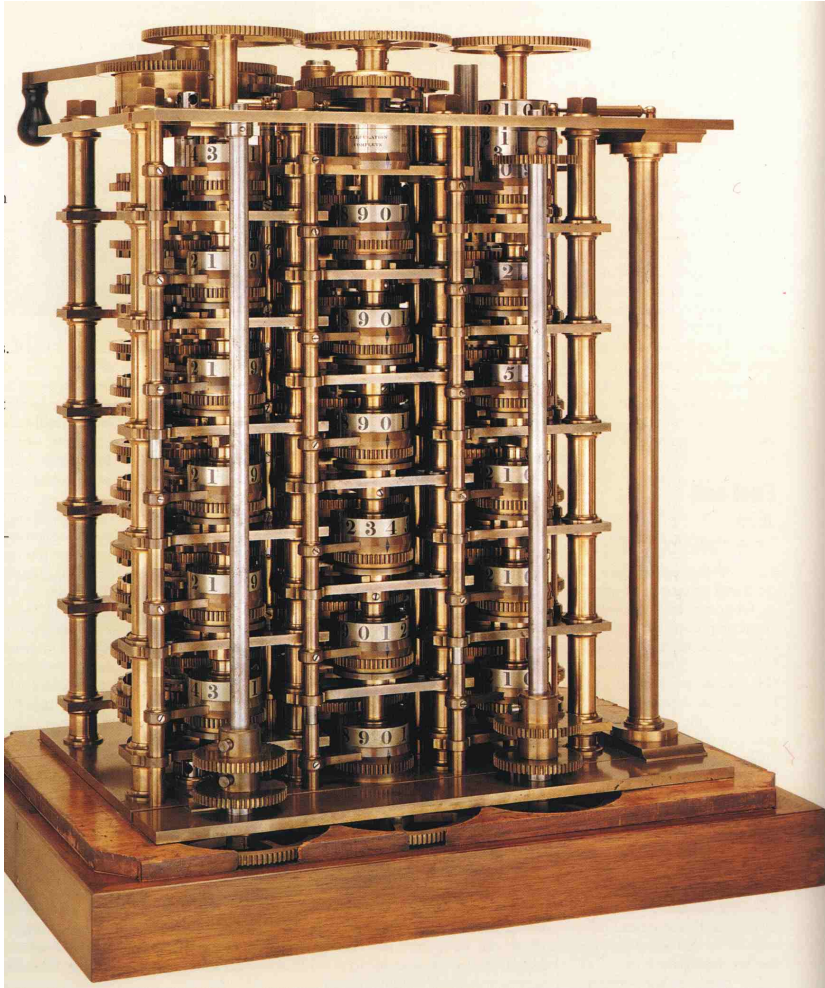
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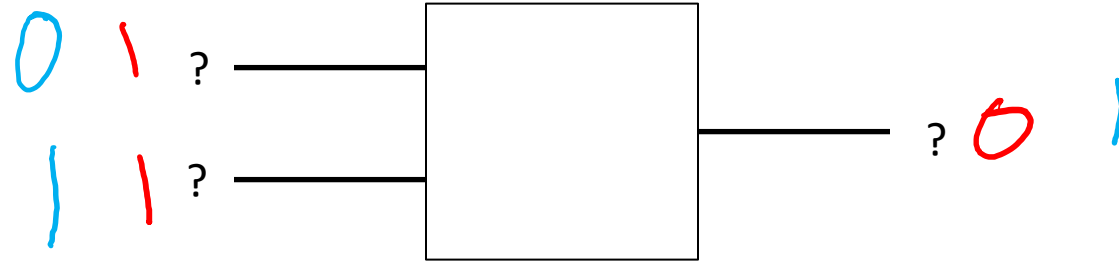
What is a computer?



Babbage's Difference Engine

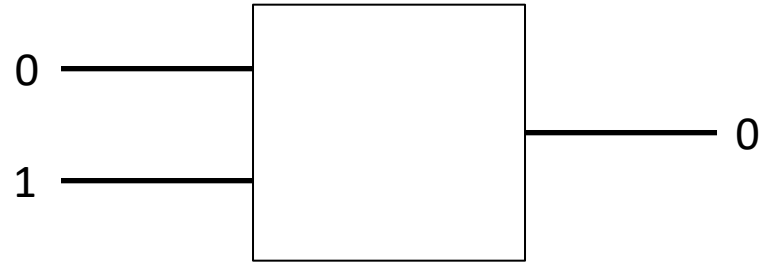


What is a computer?



- A device that reliably combines a given set of inputs to create the same output

But, that's not a computer



```
def main():  
    n = eval(input( "How many numbers should I sum?: "))  
  
    sum = 0  
    for i in range(1,n+1):  
        sum = sum + i  
    print("The sum of the first", i, "positive integers is", sum)  
  
main()
```

Abstraction

- Non-metaphorical thought is only possible when we talk about purely physical reality.
 - George Lakoff, *Metaphors We Live By*
- What does this mean when we think about computers?

Discuss with your neighbors

- Introduce yourselves
- What are some different metaphors we use in computers?
- Non-metaphorical thought is only possible when we talk about purely physical reality.
 - George Lakoff, *Metaphors We Live By*
 - What does this mean when we think about computers?

Computer Metaphors

Levels of Abstraction

- User Interfaces
- High Level Languages
- Assembly Language
- Instruction Set Architectures
- Physical chip

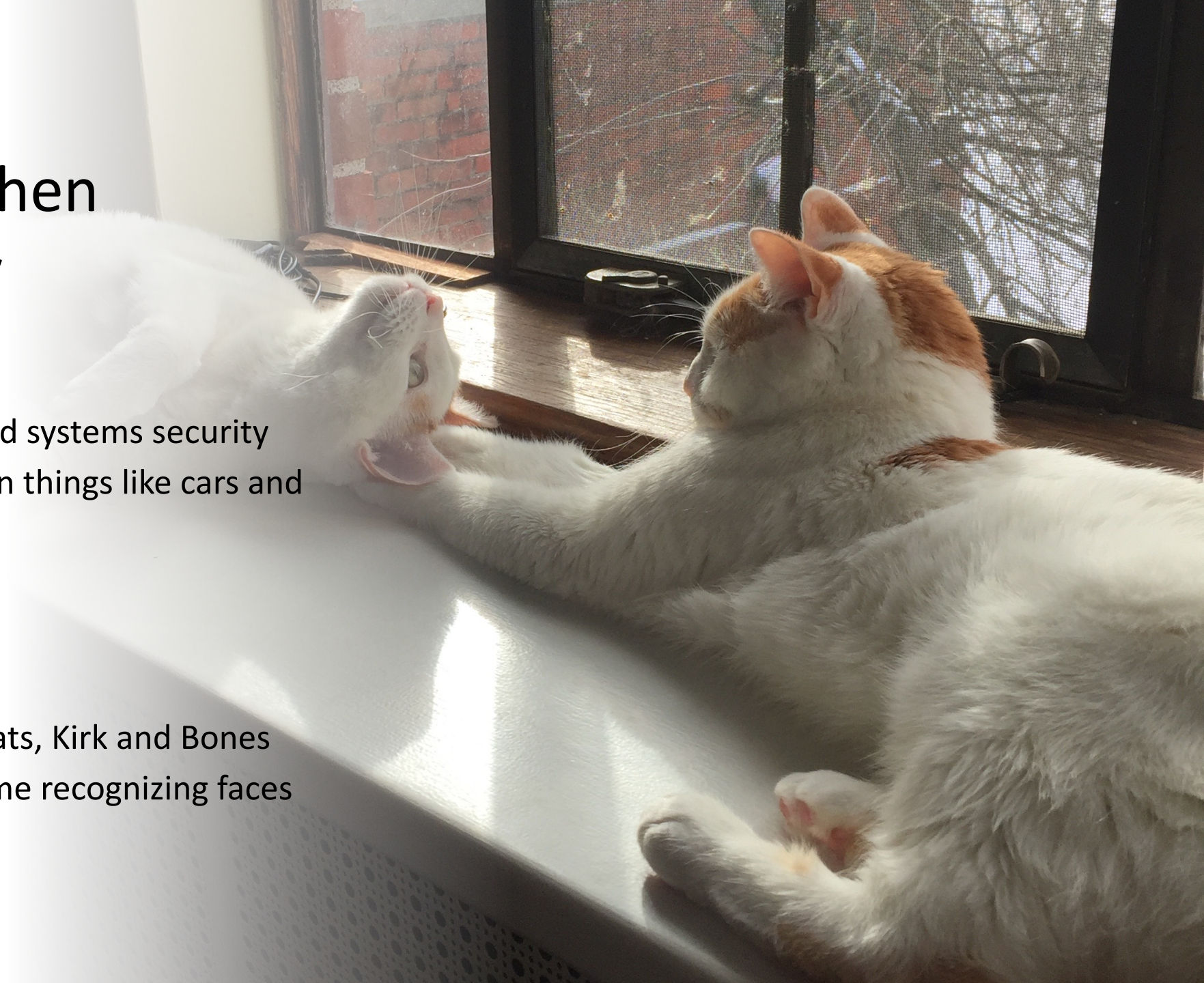
In This Class

- What are the fundamentals we build these abstractions on top of?
- How do we create these abstractions?

Who am I?

Professor Stephen Checkoway

- Research:
 - Computer/Embedded systems security
 - Hacking computers in things like cars and planes
- Fun Facts:
 - I enjoy picking locks
 - I have two Oberlin cats, Kirk and Bones
 - I have a *very* hard time recognizing faces



Class will be graded based on:

- Labs — Programming assignments
- Problem Sets — Written assignments
- Reading Exercises — From the zybook
- Class participation — Clicker questions!

Labs

- Programming assignments designed to explore the architecture concepts we learn in class
 - Java, MIPS, logic gates
- Due Sundays at 23:59

Problem Sets

- Written assignments where you solve problems related to computer architecture
- Examples:
 - Converting numbers to binary or hex
 - Simple MIPS programs
 - Drawing circuit diagrams
 - Answering questions about the datapath

Problem Sets

- Can be resubmitted within 1 week of receiving your grade
- Final problem set grade is 25% your original submission grade, 75% your new grade.
- Due Fridays at 23:59
- Problem Set 0 due next Friday!

Reading

- We will be using a zybook
- Can buy directly from zybook, or buy an access code from the bookstore
 - Sign in or create an account at learn.zybooks.com.
 - Enter zybook code: OBERLINCSCI210CheckowaySpring2022
 - Subscribe
- If you cannot afford the textbook, Oberlin's Emergency Textbook fund can offer you a loan due only when you are financially able

Reading

- Due BEFORE CLASS on the day it is listed on the class schedule
- <https://checkoway.net/teaching/cs210/2022-spring/schedule.html>

Clickers!



- Lets you vote on multiple choice questions in real time.
- Like pub trivia, except the subject is always computer architecture.
- You need one by next Monday

Group Discussion Norms

- Make sure everyone gets to talk.
- Have everyone state their answer before discussing which answer is correct.
- Take turns reporting out.
- If you think someone is wrong, ask them to explain their thinking rather than just dismissing it.

Class Norms

- Contribute as you feel comfortable
 - If you're not comfortable answering, you can pass.
 - If you're not usually inclined to speak much in class, push yourself to ask questions more often.
- Be aware of the space you take up in class
 - Make space for others, use some space for yourself
- The main goal of every person in the class should be to engage proactively with the ideas we understand the least. If someone asks a question/makes a comment that seems obvious to you, show them respect.

Collaboration Policy

- Discuss the labs/problem sets with anyone
- Post questions on piazza
- Don't show anyone your code
- If you work through how to solve a problem, please change relevant numbers from the assigned problems
- Must write down answers separately

The Challenge of Computer Architecture

- The industry changes faster than any other.
- The ground rules change every year.
 - new problems
 - new opportunities
 - different tradeoffs
- It's all about making programs run faster or use less energy or provide more features than the other company's machine.

Understanding Computer Architecture Will Let You

- Write better code
- Write faster code
- Understand what is and isn't possible

Reading

- Next lecture: Assembly Language
 - Read zybook Section 1.3 & 1.4
- Problem Set 0 due next Friday at 23:59