CS 31: Intro to Systems
Course Introduction

Vasanta Chaganti & Kevin Webb

Swarthmore College

September 5, 2023

Welcome to CS31!

Today:

- What this course is about

- Why computer systems is awesome

- Course Structure

If you're on the wait list…

- Please sign in!

- Attend class on Thursday and one of the labs on Friday to stay on the wait list.
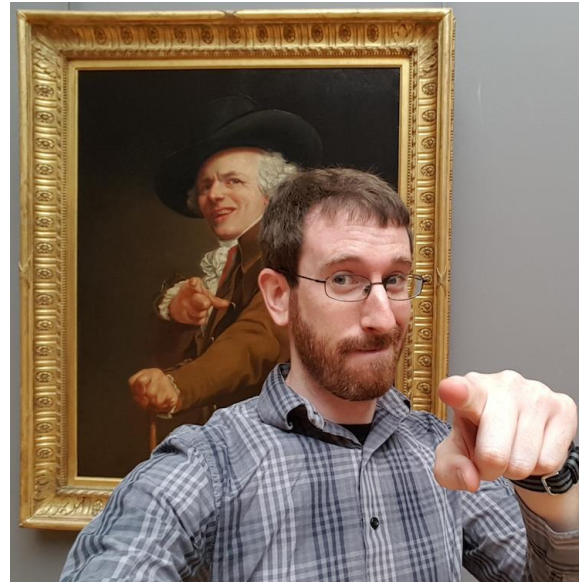
What This Class Is About

1. How a program executes on the hardware

2. The systems costs of program execution

3. An introduction to operating systems

4. Foundations of parallel programming

Course Staff

Vasanta Chaganti
SCI 253

Kevin Webb
SCI 255

Jocelyn Corey
SCI 252 B

| Office Hours | T: 2.30 – 4.00 PM | W: 11:30 AM –   1:00 PM | W: 1:15 - 3:15 PM |
| | Th: 2.30 – 4.00 PM | Th: 10:30 AM – 12.00 PM | |

Ninjas!

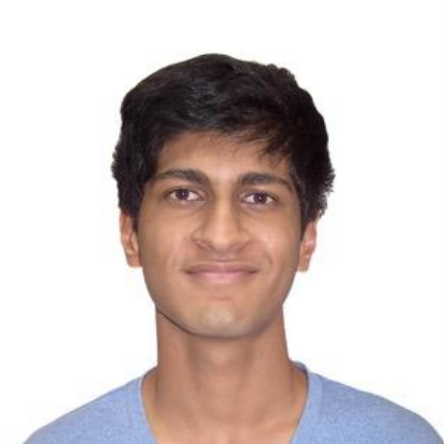- Sessions Wednesdays 6 PM - 10 PM in SCI 256

Mavis

Marlea

Rain

Sarthak

Tonight

- Using Unix help session
  - 7:00 PM – 8:00 PM
  - Open to everyone
  - **If this is your first CS course here, you should go**!

  - Location: SCI 256

Resources

- EdSTEM Q&A Forum
  - https://edstem.org/us/courses/44217/discussion/

- Slides & recordings on course website

- Lab sections:

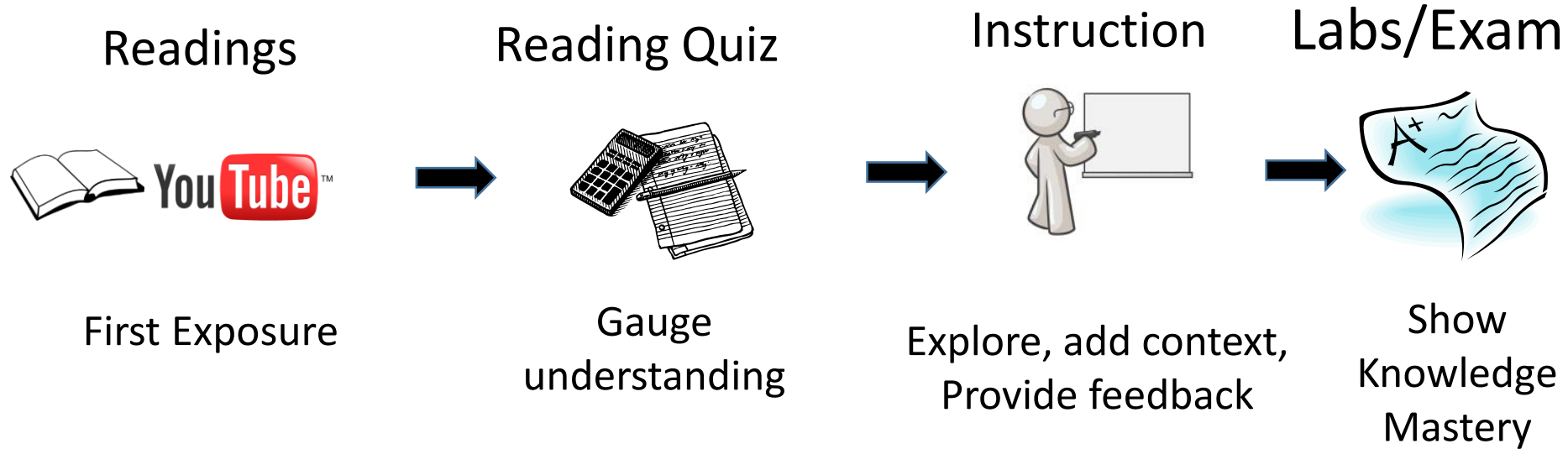| Section A | Friday 8:50 AM - 10:20 AM (Chaganti) | SCI 240 |
Section B	Friday 2:00 PM - 3:30 PM (Corey)	SCI 240
Section C	Friday 3:45 PM - 5:15 PM (Corey)	SCI 240
Section D	Friday 3:45 PM - 5:15 PM (Webb)	SCI 256

Email Policy

- For *general* or *lab* questions, please use EdSTEM rather than email.
  - Your classmates benefit from your questions
  - Your classmates can answer your questions
  - I will check the forum frequently

- For *personal* questions, feel free to directly email me.

- I will attempt to respond to within 24 hours (often sooner)

Please be mindful…

Diversity, inclusion, and a mutual sense of belonging are all core values of this course. All participants in this course must be treated with respect by other members of the Swarthmore CS community. We must all strive, students and faculty both, to never make anyone feel unwelcome or unsafe in any way. Violations of these principles are viewed as unacceptable, and we take them very seriously. If you ever feel discriminated against or otherwise excluded, no matter how minor the offense, we encourage you to reach out to Vasanta, Kevin, Jocelyn or one of the college deans.

- Differing background / experience
  - Class year
  - Having taken CS 35
  - Pre-college experience

Classes: Interactive Classes with Peer Instruction

Readings   Reading Quiz   Instruction   Labs/Exam

First Exposure   Gauge understanding   Explore, add context, Provide feedback   Show Knowledge Mastery

- You do the "easy" part before class
- Class is reserved for interactive, customized experiences
- To learn, <u>YOU must actively work with a problem </u>and construct your own understanding of it

Peer Instruction: In-class discussions

- Based on readings for that day

- Individually think about the questions (1 -2 minutes)

- Discuss: Analyze problems with your group

  - (5 – 10 minutes): Sarthak and I will walk around discussing these with you

  - Practice analyzing, talking about challenging concepts

  - Reach consensus

  - If you have questions, raise your hand and I'll come over

- Class-wide discussions Led by YOU (students) – tell us what you talked about in discussion that everyone should know!

Why Peer Instruction?

- You get a chance to think.
- I get feedback as to what you understand.
- It's more engaging!
- Research shows it promotes more learning than traditional lecture.

Locating your Clicker ID

Hexadecimal number: numbers 0-9 and letters A – F

ID is also visible when you turn your clicker on.

iClicker with Hexadecimal ID

Clickers!

- Lets you vote on questions in real time.
- Like pub trivia, except the subject is always computer systems ☺

Clicker Registration

https://forms.gle/SgfkWkwF8KhRafmw6

If you don't register your clicker, I can't give you credit for quizzes / participation!

Participation scores count from week

Example Question

- Individual vote

- Group discussion / group vote
  - Room should be LOUD

- Class discussion

Grading

- 5% Reading Quizzes
- 5% Class participation
- 25% Midterm Exam
- 30% Final Exam
- 35% Lab Assignments and Homeworks

Grading

- 5% Reading Quizzes
- 5% Class participation
- 25% Midterm Exam
- 30% Final Exam
- 35% Lab Assignments and Homeworks

- I will drop your three lowest quizzes/no-shows.

Reading Quizzes

- Readings from online textbook
  https://diveintosystems.org

- Target difficulty: did you read?

- Goal: incentivize / reward preparation
  - Can be an easy 5%!

Policies: Late Submissions

Genie (as William F. Buckley Jr)"
There are a few,..provisos, a, a couple
of quid pro quos." - in Aladdin

- Lab Lateness
  - 2 days of extra time for the semester (granularity of days)
  - Email AFTER you are done!
  - No Email: Grade whatever is present at the deadline.

Policies: Academic Dishonesty

- Collaboration

  - **You may discuss approaches, not solutions**

  - You must submit your own work

  - Exams may include questions on programming

- Cheating

  - We take this very seriously. It can have a negative impact on your course grade, your GPA and your record at Swarthmore and beyond.

  - **Don't do it!**

Policies: Academic Dishonesty

- Few examples of cheating on labs

  - Screen sharing with folks not in your lab partnership

  - "Let me read my code out to you, or share the exact API for a particular function"

  - Share in words the content in your code: "I first used strncpy to copy the string up to n bytes, and then appended a null character at the end"

  - I'm applying a "security mindset" to "think like an attacker" on course assessment infrastructure

Policies: Academic Dishonesty

- Examples of how not to cheat:
  - Behave as though you are a CS ninja
  - "What approaches did you try so far?", "Looks like you have gotten more of the string than you need to, use man pages to look at other string functions"
  - Don't know how to help your friend? Ask them to post to Edstem to the class or send a post privately to me.

Policies

- Collaboration
  - You may discuss approaches, not solutions
  - You must submit your own work
  - Exams may include questions on programming
- Cheating
  - Zero tolerance for cheating, don't do it!
- Lab Lateness
  - 2 extra days for the semester

Tentative Schedule

- Midterm – Oct 12, during class time

- Final - TBD

- Labs
  - Out on Fridays (lab section)
  - Due on Thursdays

- It's been a weird couple of years …and it's okay to not be on top of everything
- Please reach out to:
    - Me (Vasanta or Kevin, Jocelyn)
    - Your Academic Advisors
    - Student Deans
    - Counseling & Psychological Services

by KC Green

Administrative Questions?

- All of this info (should be) on class website

- Feel free to ask on class discussion board

What is a computer system?

- Hardware and/or software that…
  - allows the user to interact with programs
  - allows programs to run and use machine's *resources*
  - makes computer easier to use
- Improves the computer's capabilities
  - performance
  - reliability
  - security
  - usability

Turn undesirable into desirable

- Turn undesirable inconveniences: reality
  - Complexity of hardware
  - Single processor
  - Limited memory
- Into desirable conveniences: illusions
  - Simple, easy-to-use resources
  - Multiple/unlimited number of processors
  - Large/unlimited amount of memory

Three big ideas

- Abstraction
  - What is the desired illusion?
  - How do we interact with it?

- Mechanism
  - How do we create the desired illusion?
  - How does it work?

- Policy
  - How do we make it work well, to meet a goal?

Why should you care?

- To know how your computer works
  - What may be wrong with your programs
  - How to enhance your computer, applications

- Systems programmers get respect
  - In high demand, get paid well

- Real-world impact

How many of the following are computer systems?

- Laptops

- Smart Vehicles

- Apple Watches, Smart Watches

- Medical Implants

- Mars Rover

A: 1   B: 2   C: 3   D: 4   E: 5

Pacman

- Pacman freaks out if you complete level 255

- Why?

Therac-25

- Anyone heard of this?

- Very similar to Pacman bug, only with tragic consequences.

- Radiation therapy machine, misdosed patients

Toyota Acceleration (2009-2011)

- Unintended acceleration

- ~9 million vehicles recalled

- "Stack overflow"

Mars Pathfinder (1997)

- Frequently locked up and stopped responding
    - (automatic reboot)

- "Priority inversion" in parallel software
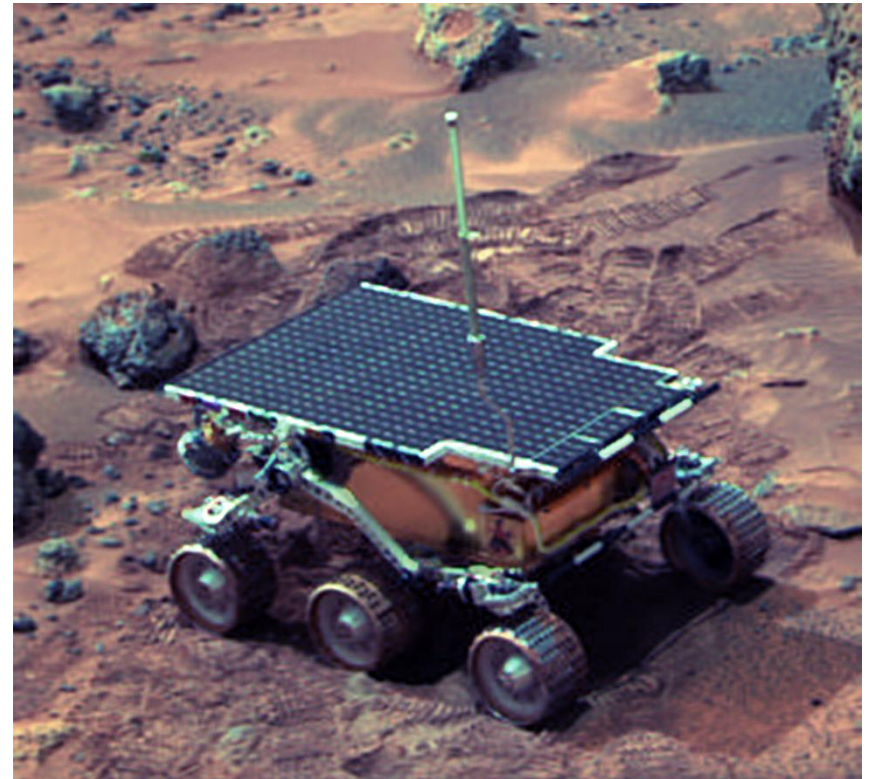
Pokémon Yellow

- Cleverly "hacked", game completed in 1:36

- "Buffer overflow" exploit

This Course

- How your programs *really* execute

- 1st half: focus on hardware execution
- 2nd half: focus on operating system

Clicker Registration

- https://forms.gle/SgfkWkwF8KhRafmw6

- If you don't register your clicker, I can't give you credit for quizzes / participation!

Background Survey

- Gives us better information for forming partnerships

- https://forms.gle/GEwMhcPzBxgcjdCJA

- Please fill this out ASAP!
  I'll be setting up partnerships for lab 1 this evening.

Your TODO list

- Readings posted on course web page.

- Log in to EdSTEM

- Fill out background / partnership survey: https://forms.gle/GEwMhcPzBxgcjdCJA

- Register your clicker, if you didn't already: https://forms.gle/SgfkWkwF8KhRafmw6

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