Week 1, Class 1
Welcome!
01/23/24

Dr. Sukrit Venkatagiri
Swarthmore College
Welcome to CS31!

Today:

• Why computer systems are awesome & sometimes scary
• What this course is about
• Course logistics and initial setup
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

• Everyone else: **sign the attendance sheet**
Toaster
Previously: Election Integrity Partnership

The New York Times

Biggest Surge of Misinformation May Arrive After Election Day, Researchers Say
People who study disinformation say experience of 2020 may not be repeated.
Nov 7, 2022

The New York Times

G.O.P. Targets Researchers Who Study Disinformation Ahead of 2024 Election
A legal campaign against universities and think tanks seeks to undermine the fight against false claims about ballots and counting.
Nov 7, 2022

PolitiFact

Why vote spikes on graphs shared by Mike Lindell are not evidence of stolen elections
MyPillow CEO Mike Lindell, an ardent supporter of former President Donald Trump, has shared numerous debunked conspiracy.
Nov 11, 2022
Course Staff

Dr. Sukrit Venkatagiri (he/him)
SCI 258
Sections: CS31 & Lab A
Office Hours*: Tue 2:30-4pm, Wed 3:30-5pm

Jocelyn Corey (she/her)
SCI 252 B
Sections: Labs B & D
Office Hours*: Wed 1-3pm
Ninjas!
Sessions on Wednesdays
6-10 PM at SCI 256

Marlea

Ben

Arden

Lisa
Grader

Aishi
Why should I take CS31?
Because I have to...
That’s not a good reason, bruh
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, mis-dosed patients

https://ethicsunwrapped.utexas.edu/case-study/therac-25
Toyota Acceleration (2009-2011)

- ~9 million vehicles recalled
- “Stack overflow” => Unintended acceleration
Mars Pathfinder (1997)

• Frequently locked up and stopped responding (automatic reboot)

• “Priority inversion” in parallel software
Environmental impact of (inefficient) computer systems
Computer systems to the rescue

The New Machinery of Medicine: How Gene Sequencing and High-Performance Computing Are Revolutionizing Care

Yale School of Medicine
For patients suffering from genetic disorders, diagnosis that can help guide
May 12, 2022

Argonne team's climate modeling work wins Gordon Bell Prize, highest honor in high performance computing

Argonne National Laboratory

Nov 16

UC Riverside engineers are using supercomputers to investigate rapid, CRISPR-based COVID-19 tests

UC Riverside

A group led by Giulia Palermo, an assistant professor of bioengineering in the Marlan and Rosemary Bourns College of Engineering,

Jun 17, 2020
In CS31, you will learn…

How your programs *really* execute

1\textsuperscript{st} half: focus on hardware execution
2\textsuperscript{nd} half: focus on operating system
In CS31, you will learn…

1. How a program executes on the hardware
2. The system’s costs of program execution
3. An introduction to operating systems
4. Foundations of parallel programming
5. The real-world relevance (and impact!) of computer systems
You’ll be able to answer…

How does software actually run on hardware?

How do computers run multiple software programs?

Why does my phone slow down when I have too many apps open?

Why is gaming so terrible on Macs?
More consequentially…

What enables computers to quickly identify new vaccines and medical treatments?

How and why is everything “in the cloud”?

Why are the US and China fighting over… computer chips?
Nine Whys (10 minutes)

• Pair up, and take turns asking: Why are you in CS31?
  Because…
  Why?
  Because…
  Why?
  .
  .
  .
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?
Logistics

• How to Be A Good Classmate
• Resources
• Instruction Style
• Clickers (!)
• Grading
• Policies and Academic Dishonesty
Our Shared Values in this Class

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 Sukrit, Jocelyn, or one of the College Deans.

• Differing background / experience
  • Class year
  • Having taken CS 35
  • Pre-college experience
How to be a Good Classmate

• **Everyone** deserves to be — and participate — in class & lab
• We can **all** learn something from one another
• Come to class prepared (readings, assignments)
• Give others a chance to answer
• Avoid distracting others during class
Resources

**Textbook** (free, online, homebrewed): *Dive Into Systems* by Matthews, Newhall, and Webb

**Q&A Forum**: EdSTEM
  - edstem.org/us/courses/52394

**Slides & recordings** on course website
  - cs.swarthmore.edu/~sukrit/cs31/s24/

**Course updates**: email + EdSTEM
Instruction Style: Active Learning

• An approach to instruction that involves actively engaging students with the course material through discussions, problem solving, case studies, and other methods¹

• A 2014 meta-analysis of 225 science, engineering, and mathematics education studies by Freeman et al.² demonstrated that active learning can significantly increase course grades over didactic (lecture). Students in courses without active learning were 1.5 times more likely to fail the course than students in courses with active learning³

---

¹ queensu.ca/teachingandlearning/modules/active/04_what_is_active_learning.html
³ https://cei.umn.edu/teaching-resources/active-learning/why-use-active-learning
Instruction Style: Active Learning

- Pre-reading
- Worksheets
- Spaced repetition & practice
- Think, pair, share
- Peer instruction

Big Geno from *Hey Arnold* extending his hand out, asking “Do we have a deal?”
Spaced Repetition & Practice

• You do the “easy” part before class
• Class is reserved for interactive, customized experiences
• To learn, **YOU must actively work with a problem** and construct your own understanding of it

---

First Exposure | Reading Quiz | Instruction | Labs/Exam
--- | --- | --- | ---
Readings | Reading Quiz | Instruction | Labs/Exam
Spaced Repetition & Practice
Gauge understanding | Explore, add context, Provide feedback | Show knowledge & mastery
In-Class Worksheets & Discussion

• Based on readings for that day

• **Think:** Individually think about the questions (1-2 minutes)

• **Pair:** Analyze problems with your group (2-3 minutes)
  • Ninjas and I will walk around discussing these with you
  • Practice analyzing and talking about challenging concepts
  • Reach consensus
  • If you have questions, raise your hand and I’ll come over

• **Share:** Briefly summarize what answer(s) your group arrived at and why
Clickers!

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

Clicker registration:
- If you don’t register your clicker, I can’t give you credit for quizzes / participation!
- Participation scores count from next week
How many of the following are computer systems? Why?

- Laptops
- Smart Vehicles
- Apple Watches, Smart Watches
- Medical Implants
- Mars Rover

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

- 5% Class participation
- 5% Reading quizzes
- 5% Homework assignments
- 30% Lab assignments
- 25% Midterm Exam
- 30% Final Exam (date TBD)

Life happens. I will drop your three lowest quizzes/no-shows, no questions asked.
Reading Quizzes

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

• Target difficulty: did you read?

• Goal: incentivize / reward preparation
  • Can be an easy 5%!
Late Submission Policy

• 5 total late days
• Email BEFORE you want to use them
• The class gets to decide the split:
  • HW vs. Lab assignments

Big Geno from *Hey Arnold* extending his hand out, asking “Do we have a deal?”
Academic Dishonesty Policy

• 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!
Academic Dishonesty Policy

• Some 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
  • I just used ChatGPT to help with “some” of my assignment.
Academic Dishonesty Policy

• 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.
  • *Don’t shortcut your learning or others’*
We’re here to help

• It’s been a weird couple of years …and it’s okay to not be on top of everything
• Please reach out to:
  • Us (Sukrit, Jocelyn)
  • Your Academic Advisors
  • Student Deans
  • Counseling & Psychological Services
• Friends
• Family

Meme of a cartoon dog surrounded by fire, saying "this is fine." by KC Green
Administrative Questions?

• All of this info is on the class website

• Feel free to ask on class discussion board (EdSTEM)
Email Guidelines

• 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
  • You can ask anonymously, if you’d prefer

• For personal questions, feel free to email me directly:
  sukrit+cs31@swarthmore.edu
Tentative Schedule

• Midterm Exam – **March 7th**, during class time
• Final Exam — TBD

• Labs — mostly done in groups
  • Released on Fridays (lab section)
  • Due on Thursdays

• HWs — mostly done in groups
  • Released on Thursdays
  • Due on Fridays
Your TODO List

• **Now:** Log in to EdSTEM: [edstem.org/us/courses/52394](http://edstem.org/us/courses/52394)

• **By Wednesday:** Register your clicker
  [forms.gle/CbSuUKkA3beeFwvE](http://forms.gle/CbSuUKkA3beeFwvE)

• **By Thursday:** Labs are partnered – fill out the match survey
  [forms.gle/GwqvvwsLYhNFCzzB6](http://forms.gle/GwqvvwsLYhNFCzzB6)

• **Before lab on Friday:** Complete Lab 0

• Readings posted on course web page, read them before each class.
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
Questions for me?
SEE YOU SOON!