Outline for today

• boring administrative stuff
  – schedule, psets, labs, grading, textbook, mechanics, ...

• course overview

• (maybe a bit of quantitative reasoning)

• A reminder:

  Parts of this course are being recorded for people who can't attend in real time.

  Recordings will be deleted after a couple of weeks. Don't plan on binge-watching at the end of the semester.

  (It would probably be bad for your mental health anyway.)
Basic info

• Brian Kernighan
  bwk@cs.princeton.edu  www.cs.princeton.edu/~bwk
  office hours: temporarily, right after class
  or make an appointment with wase.princeton.edu or by email
  TGIF Friday 5pm?

• course assistants:
  Francisca Weirich-Freiberg '21 (fsw2@), Abby Gupta '22 (amgupta@)

• web site:  www.cs.princeton.edu/courses/archive/fall20/cos109
  (Canvas is mostly for recordings and links to other places)

• please fill out the survey (on Canvas and web site, or forms.gle/cZYdW7xSdPMi3RfP6)
• first problem set is due midnight Thursday Sep 10
• first lab is due midnight Sunday Sep 13
Administrivia  (check the web page for updates!)

- notes will be posted online ahead of time
  - but not everything will be in them or in the textbook
- readings: ~ 1 hour/week, before class
- 7 problem sets: ~ 1-2 hours each
  - posted Wednesday, due following Thursday midnight
- 7 labs: ~ 2-3 hours each, plus reading to prepare
  - posted by Saturday, due following Sunday midnight
  - do the labs on your own, any time
- open-book midterm during midterm week
- open-book final exam during December exam period
- grading (approximately):
  20% problem sets + 20% labs + 20% midterm + 35% final + 5% participation
- regular attendance at lectures is required; participation helps
Textbook

• I will distribute a PDF draft of the new edition soon.

• It's not yet frozen: comments are welcome.

• good supplementary reading if you're interested in privacy and security =>
House rules

• turn on your video if at all possible (backgrounds are fine)
  – it helps to keeps you and me engaged

• ask questions about anything any time
  – raise your real or virtual hand, speak up, or use chat

• let me know if there's anything I can do to make this work better
  – directly, or via Abby and Francisca
Buzzwords!
Some of this year's buzzwords

- social media
- fake news, disinformation
- facial recognition
- privacy, surveillance, tracking
- cloud computing, big data
- artificial intelligence, machine learning
- hackers, hacking
- ransomware
- GDPR, CCPA
- big tech, antitrust
- cyber-[everything]
- self-driving cars
- Internet of Things
- robocalls
- drones
Things to notice

• pervasive computer systems; we depend on them completely
• complicated mixture of legal, political, economic, social issues

• running themes:
  privacy & security
  money & property
  rights: individual, government, corporations
  jurisdiction: who gets to decide

• things are changing at a rapid rate
  – Google is 22: founded in Sept 1998
  – Facebook is 16: founded in 2004
  – Twitter is 14: founded in 2006
  – iPhone is 13: appeared in 2007
  – Instagram is 10: Oct 2010
  – Zoom is 9: April 2011
Course outline

• hardware (3-4 weeks)
  – how computers represent and process information
  – what's inside a computer, how it works, how it's built

• software (3-4 weeks)
  – how we tell computers how to do things
  – a very gentle introduction to programming in Javascript and Python

• communications + data (3-4 weeks)
  – how the Internet and the Web work
  – big data, machine learning, artificial intelligence
  – threats and defenses: privacy, security, cryptography

• along the way
  – current events, history, QR / QCR, ...
Hardware: tangible devices and gadgets

• how computers represent and process information
  – universal digital representation of information:
    everything is represented as numbers
  – bits, bytes, binary

• a computer is a universal digital processor
  – it stores data and instructions in the same memory
  – the instructions are numbers
  – it's a general purpose machine:
    change the numbers and it does something different
  – your phone is a computer

• hardware has been getting smaller, cheaper, faster exponentially for 50+ years
Software: telling computers what to do

• algorithms
  – precise sequences of steps to perform various tasks
  – what's possible, what’s feasible, what's efficient
    some problems are intrinsically very hard (we think)

• programs and programming
  – implementation of algorithms to be run on a computer
  – programming languages: how to express the steps
  – real programs: operating systems and applications

• software intellectual property issues
  – patents, copyrights, standards, ...
Communications: computers talking to each other

- the Internet is a universal digital network
  - depends on protocols, standards, agreements, cooperation
- we can easily communicate with people anywhere
  - we are visible to and accessible by strangers everywhere
- information passes through many sites
  - where it can be inspected, modified, blocked, slowed down, …
- personal privacy and security are at risk
  - tracking, data aggregation, surveillance (government and commercial)
  - phishing, identity theft, …
  - viruses, worms, bots, hijacking, trolls, disinformation, …
- everything on the Internet is vulnerable
  - cyber attacks
  - Internet of Things
It's not just computers

• computers and networking are spreading into devices
• devices are increasingly powerful
• devices and systems are increasingly connected to the Internet: "Internet of Things"

phones
games, toys
consumer electronics: Alexa et al, smart TVs, Fitbit, ...
cars (self-driving or not)
planes
medical systems
infrastructure: telephone, power, transportation, ...
weapons
...

Goals of the course

• understanding how digital systems work
  – hardware, software, communications
  – representation, processing, storage, transmission of information
  – principles, not just today's details and buzzwords
  – a handful of useful skills

• some sense of the past and possible futures
  – history, trends, potential, intrinsic limitations, tradeoffs

• some appreciation of computer science as a discipline
  – great ideas, algorithms, capabilities and limits of computers
  – and its usefulness in other academic fields

• useful quantitative reasoning
  – numeracy: reasoning, estimation, assessing numbers, ... 
  – judgment: do the numbers make sense? are they plausible?

• intelligent skepticism about technology