COS 109 basic info
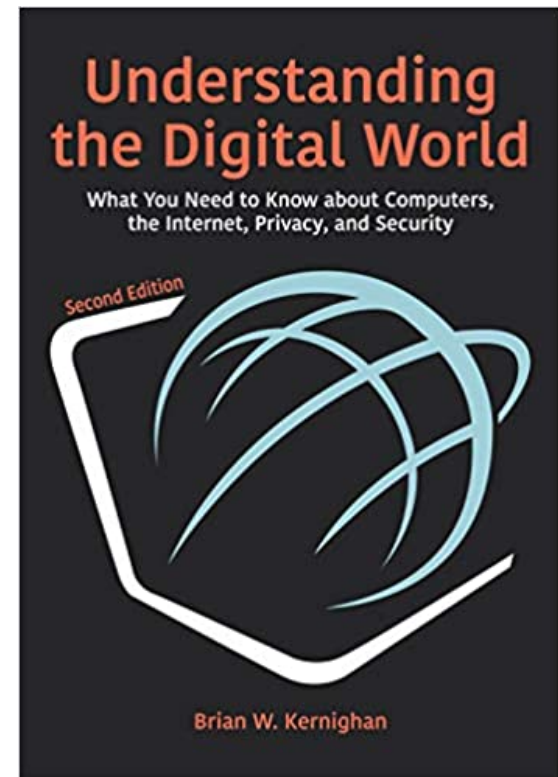
- Brian Kernighan

    bwk@cs.princeton.edu   www.cs.princeton.edu/~bwk

    office hours: right after class or make an appointment

    Archie McKenzie '24, archiem@princeton.edu, Wed 3-6 & Sun 6-9
    Anika Maskara '23, amaskara@princeton.edu, TBD

- web site: www.cs.princeton.edu/courses/archive/fall23/cos109

    (we won't use Canvas very much)

- **please fill out the survey** (link is also on web site)

    https://forms.gle/cZYdW7xSdPMi3RfP6

- first problem set due midnight Wednesday Sep 13
- first lab due midnight Sunday Sep 17

    (both are posted on the course web page)

Administrivia   (check the web page for updates)

- notes will be posted online
  - but not everything will be in them or in the textbook
- readings: ~ 1 hour/week, before class
  - textbook readings are important; most others are cultural enrichment
- 8 problem sets: ~ 1-2 hours each
  - posted by Wednesday, due following Wednesday by midnight
- 8 labs: ~ 2-3 hours each, plus reading to prepare
  - posted by Sunday, due following Sunday by midnight
- open-book take-home midterm during midterm week
- open-book take-home 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

- 2nd edition is definitely preferable

  - get the paperback version!

- 1st edition is ok

- I encourage you to buy at Labyrinth

Understanding the Digital World

What You Need to Know about Computers, the Internet, Privacy, and Security

Second Edition

Brian W. Kernighan

House rules

- COVID precautions
  - for now, please be vaccinated, boosted, socially distanced

- turn off your phone and laptop
  - it helps to keep you and me engaged

- ask questions / make comments / ... about anything any time

- let me know if there's anything I can do to make this work better

- questions so far?

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 rapidly:
    - ~~Google~~ Alphabet is 25: founded in 1998
    - ~~Facebook~~ Meta is 19: 2004
    - ~~Twitter~~ X is 17: 2006
    - iPhone is 16: 2007
    - Instagram is 13: 2010
    - Zoom is 12: 2011
    - TikTok is 7: 2016
    - ChatGPT is *only 9 months old* ! Nov 30, 2022   (discussed in class Dec 5, 2022)

COS 109 ChatGPT policy

For now:

– You *may not* use ChatGPT or similar generative AI programs for problem sets.

– You may use ChatGPT *et al* for labs for finding out how to use languages and tools, but not for generating any significant parts of any lab. If you do use ChaptGPT or the like, you must say so and describe how you used it.

– You may use ChatGPT *et al* for helping you to understand course material better, e.g., "explain binary numbers to me, one more time."

– [You can't use a computer at all for midterm and final exams.]

We'll revisit this as we go along.

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 Python

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

- along the way
  - current events, history, 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 exponentially smaller, cheaper, faster for over 60 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, copied, 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

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 and appliances:

Alexa et al, smart TVs, Fitbit, Ring, Nest, ...

cars (self-driving or not)

planes

medical systems and devices

infrastructure: phones, power, transportation, manufacturing, ...

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 QCR
  - numeracy: reasoning, estimation, assessing numbers, ...
  - judgement: do the numbers make sense? are they plausible?
  - enough programming that it's not a mystery

- intelligent skepticism about technology