Why Are We Here?

Each of us probably has our own personal reasons...

- CS is intellectually deep!
- CS has exciting applications in many varied fields!
- CS allows us to be at the cutting edge!
- CS is financially rewarding!
Digital Revolution

Technology is already playing a huge role in our everyday lives...

...and that trend seems only likely to accelerate with the rise of “smart devices”, self-driving cars, machine learning...

Source: NBC News
In a world run by algorithms...

Computer scientists are increasingly being asked to grapple with questions like:

*What does it mean to live in a world where our cars and all of our home appliances run algorithms?*

The response “I’m just a technologist” is not acceptable!

Have to think about issues like safety, privacy, fairness, etc.

Source: Wired, Archinect
Question

Do you believe that Facebook is good or bad for society?
A: Excellent
B: Good
C: Neutral
D: Bad
E: Awful

Source: Skirpan et al., Facebook
Question

Do you believe that facial recognition technology is good or bad for society?

A: Excellent
B: Good
C: Neutral
D: Bad
E: Awful

Source: Skirpan et al., Greenbot
Question

Do you believe that Facebook should use face recognition technology to automatically identify untagged people?

A: Excellent
B: Good
C: Neutral
D: Bad
E: Awful
Why CS Ethics?

The decisions we make about the algorithms we design and the systems we build have a huge impact on the lives of billions of people around the world!

Important to understand the potential impacts of our actions and to make deliberate decisions

Source: Huffington Post
SAFETY
Example: CitiGroup Tower
CitiGroup Tower Timeline

- Constructed in 1977
- Design incorporated a 400-ton damper to ensure stability even in strong winds

- In 1978, an NYU student contacted chief structural engineer LeMessurier to tell him the building is in danger of blowing over.
- LeMessurier realizes he neglected to consider “quartering” winds, so a 16-year storm could knock it over.
- Worse, if power outage caused damper to fail, just a 16-year storm could do it...
- Hurricane Ella was coming up the east coast!

Scrambled a secret effort to strengthen the building.

Source: LeMessurier
Joe Morgenstern.
“The Fifty-Nine-Story Crisis.”
Scenarios

What if you are writing code that...

• Controls a pacemaker or other medical device?
• Transfers electricity between stations on the smart grid?
• Detects pedestrians / cyclists in a self-driving car?
• Runs the control system at a nuclear power plant?

Sources: New Atlas, Siemens, Tesla, University of Leeds
Code of Ethics for Engineers

• Hold paramount the safety, health, and welfare of the public
• Perform services only in areas of competence
• Issue public statements only in an objective and truthful manner
• Avoid deceptive acts
CENSORSHIP, PRIVACY, AND SURVEILLANCE
This is a personal issue for me...
Internet

Source: Shodan.io
Networks Enable Free Expression
Networks Enable Mass Surveillance

Source: Brave New Cloud, TechNews
Example: Encore (SIGCOMM ’15)

• Browser-based tool for measuring censorship
• Deployed onto ~88k clients in 170 countries
Encore: Ethical Issues

• Did participants consent to participate?
• Was there a risk of potential harm to participants and did the researchers take reasonable steps to minimize harm?
• Does Internet measurement constitute human subjects research and should academics be held to a higher standard than companies?
• Are there legal implications of redirecting people to websites they did not intend to visit?
WARFARE
DoD Project Maven

- CS ideas are being deployed on the battlefield
- Offensive cyberattacks
- Vision + ML → Drones
- How should we write algorithms that might kill another human?

Source: The Verge, sUAS news
Ethical Issues

• What should the criteria be for deploying cyber weapons?
• If we develop cyber weapons, how can we protect them from being acquired and (mis) used by adversaries?
• How do we guard against collateral damage?
• What safeguards do we need to put in place to make sure we don’t develop killer robots?
ALGORITHMIC FAIRNESS
Redlining

• In 1930s, the US FHA set up various mortgage assistance programs
• But decisions were made using maps that tightly correlate with racial identity
• Effects: increased segregation, urban decline
Deep Learning to the Rescue?

• Many companies are shifting to automated, data-driven decision processes

• Algorithms will soon be making decisions about:
  – Insurance rates
  – Mortgage eligibility
  – Hiring

Source: Google Cloud
Bias in Data

Source: Moritz Hardt
Fairness in Machine Learning

Source: Moritz Hardt
Ethical Issues

• How do we design machine learning algorithms that are *fair* and *explainable*?
• How do we guard against inherent biases in existing data sets used for training?
• On the positive side, how can we use machine learning techniques to improve social welfare?
Question

What is the best current approach to classifying cat images on the Internet?

A: Decision Trees
B: Support Vector Machine
C: Deep Neural Network

Source: Reader’s Digest
WRAPPING UP
What next?

• Please keep in touch!
  – Let me know when 3110 helps you out in future courses (or jobs!)
  – Come ask me cool PL questions
  – Drop by to tell me about the rest of your time in CS (and beyond!)… I really do like to know

• Finishing this course is only the beginning of your next race…
  DO AMAZING THINGS WITH YOUR LIFE