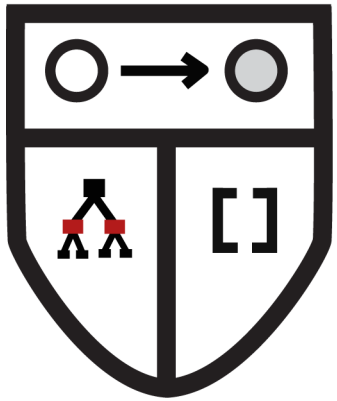


CS 3110

Ethical Issues in CS

Nate Foster

Spring 2018

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 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 accellerate with the riseof “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 worked 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?

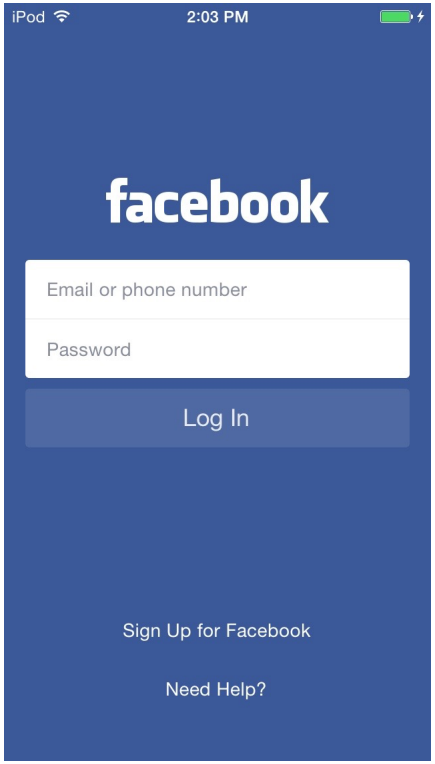
A: Excellent

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?

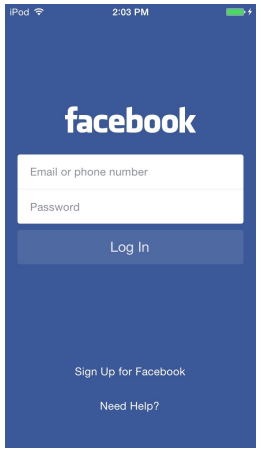
A: Excellent

B: Good

C: Neutral

D: Bad

E: Awful



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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

Source: Adam Macchia

CitiGroup Tower Timeline

- Constructed in 1977
- Design incorporated a 400-ton damper to ensure stability even in strong winds
- In 1
- Le M
- Wo
- Scra

Source: LeMessurier

Joe Morgenstern.
"The Fifty-Nine-Story Crisis."
New Yorker, May 29, 1995.

CITY PERILS

THE FIFTY-NINE-STORY CRISIS

What's an engineer's worst nightmare? To realize that the supports he designed for a skyscraper like Citicorp Center are flawed—and hurricane season is approaching.

BY JOE MORGENSTERN

On a warm June day in 1978, William J. LeMessurier, one of the nation's leading structural engineers, received a phone call at his headquarters, in Cambridge, Massachusetts, from an engineering student in New Jersey. The young man, whose name has been lost in the swirl of subsequent events, said that his professor had assigned him to write a paper on the Citicorp tower, the slash-topped silver skyscraper that had become, on its completion in Manhattan the year before, the seventh-tallest building in the world.

LeMessurier found the subject hard to resist, even though the call caught him in the middle of a meeting. As a structural consultant to the architect Hugh Stubbins, Jr., he had designed the twenty-five-thousand-ton steel skeleton beneath the tower's sleek aluminum skin. And, in a field where architects usually get all the credit, the engineer, then fifty-two, had won his own share of praise for the tower's technical elegance and singular grace; indeed, earlier that year he had been elected to the National Academy of Engineering, the highest honor his profession bestows. Excusing himself from the meeting, LeMessurier asked his caller how he could help.

The student wondered about the columns—there are four—that held the building up. According to his professor, LeMessurier had put them in the wrong place.

"I was very nice to this young man," LeMessurier recalls. "But I said, 'Listen, I want you to tell your teacher that he doesn't know what the hell he's talking about, because he doesn't know the problem that had to be solved.' I promised to call back after my meeting and explain the whole thing."

The problem had been posed by a church. When planning for Citicorp Center began, in the early nineteen-seventies, the site of choice was on the east side of Lexington Avenue between Fifty-third and Fifty-fourth Streets, directly across the street from Citicorp's headquarters. But the northwest corner of that block was occupied by St. Peter's Church, a decaying Gothic structure built in 1905. Since St. Peter's owned the corner, and one of the world's biggest banking corporations wanted the whole block, the church was able to strike a deal that seemed heaven-sent: its old building would be demolished and a new one built as a freestanding part of Citicorp Center.

To avert disaster, LeMessurier knew that he would have to blow the whistle quickly—on himself.

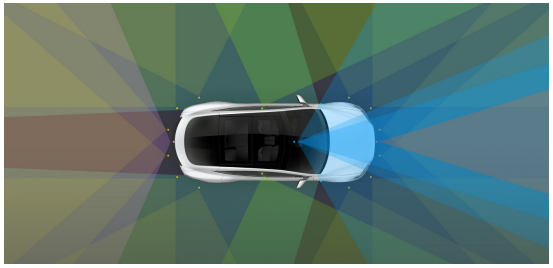
GARY POWELL

To clear space for the new church, Hugh Stubbins and Bill LeMessurier (he pronounces his name "LeMeasure") set their fifty-nine-story tower on four massive, nine-story-high stilts, and positioned them at the center of each side, rather than at each corner. This daring

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

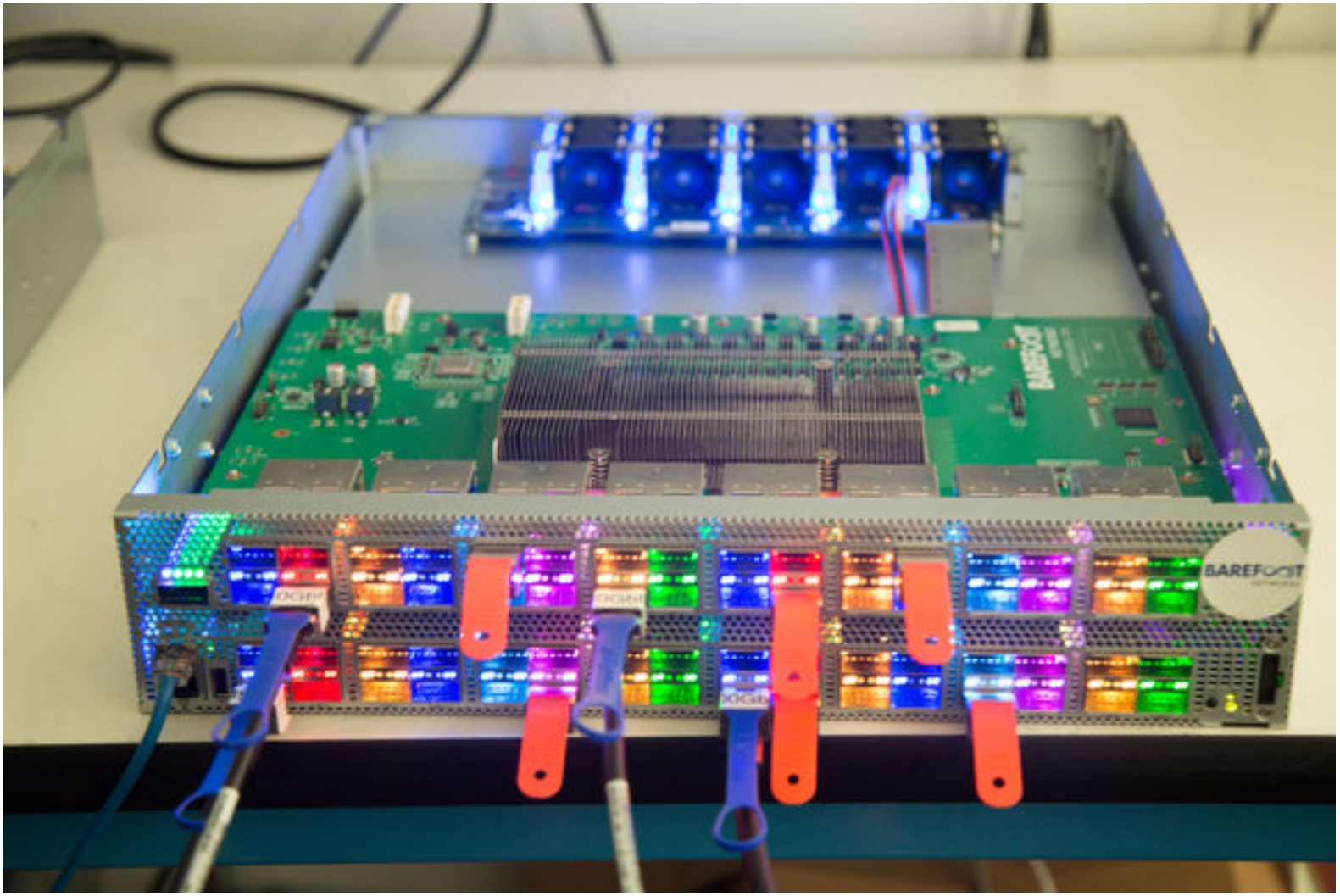
Code of Ethics for Engineers

- 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

Source: HelpToStudy

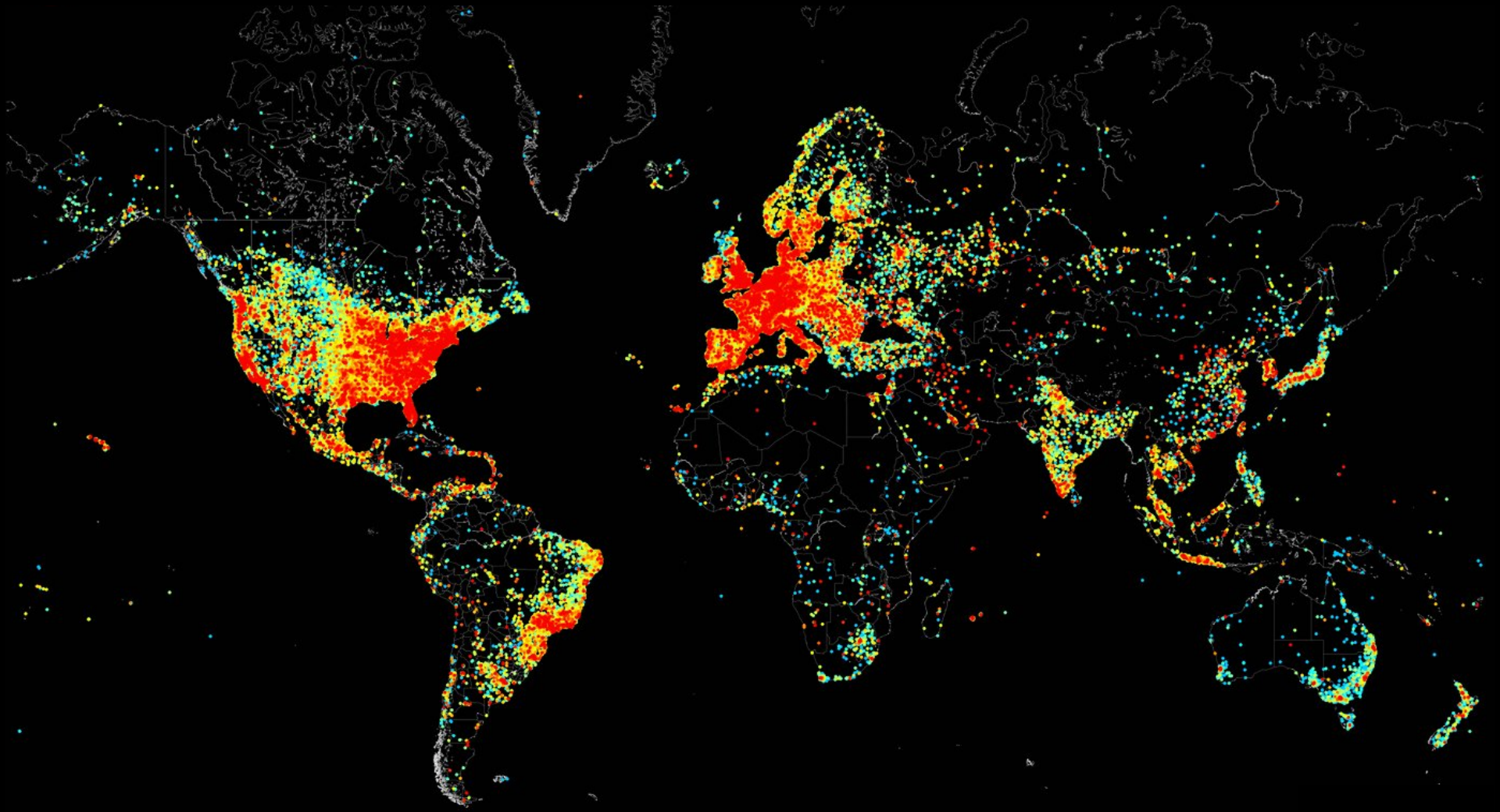
CENSORSHIP, PRIVACY, AND SURVEILLANCE

This is a personal issue for me...



Source: Barefoot

Internet

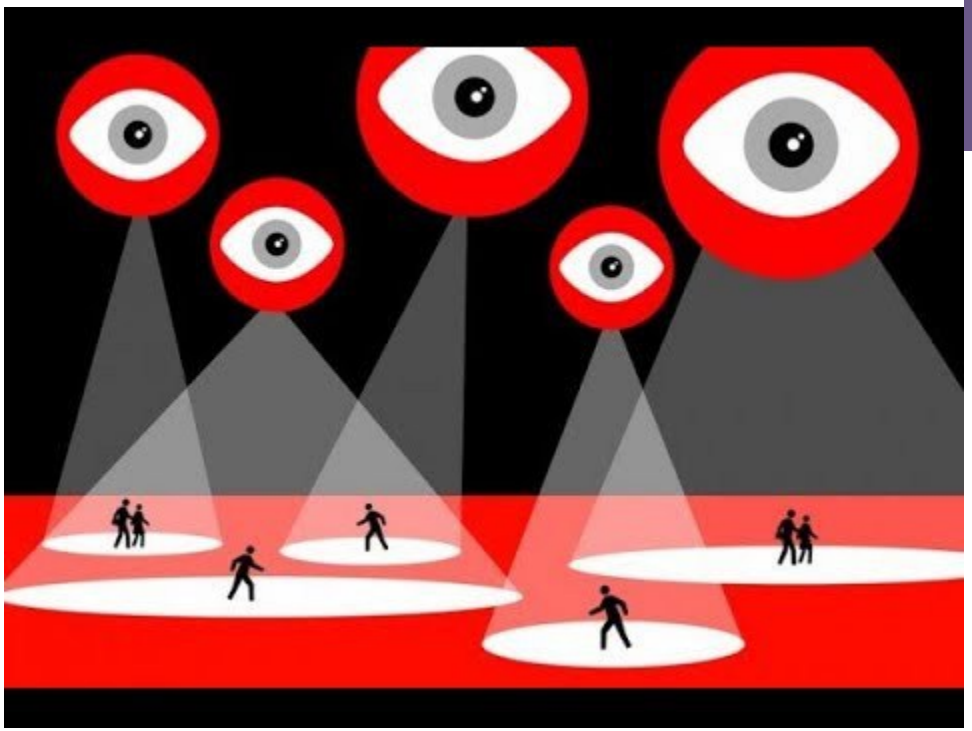


Source: Shodan.io

Networks Enable Free Expression

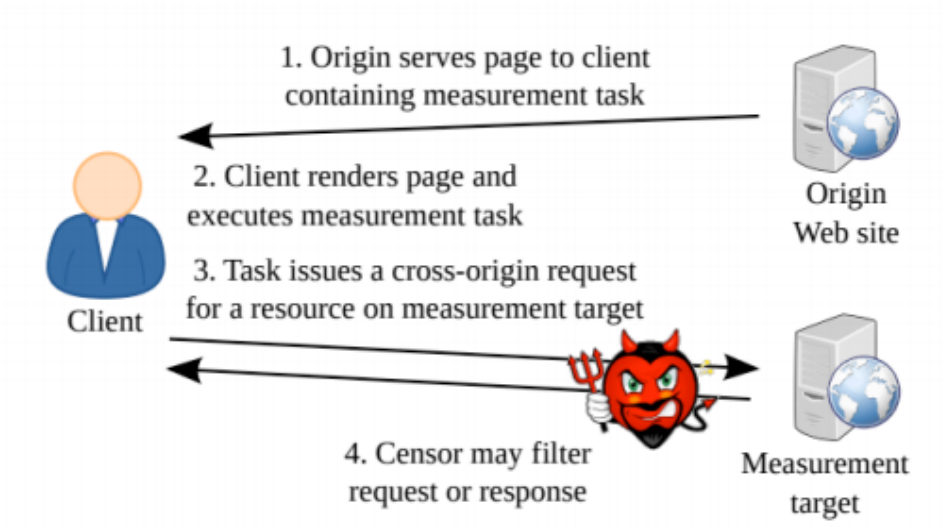
Source: Huffington Post, Windsor Square

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?

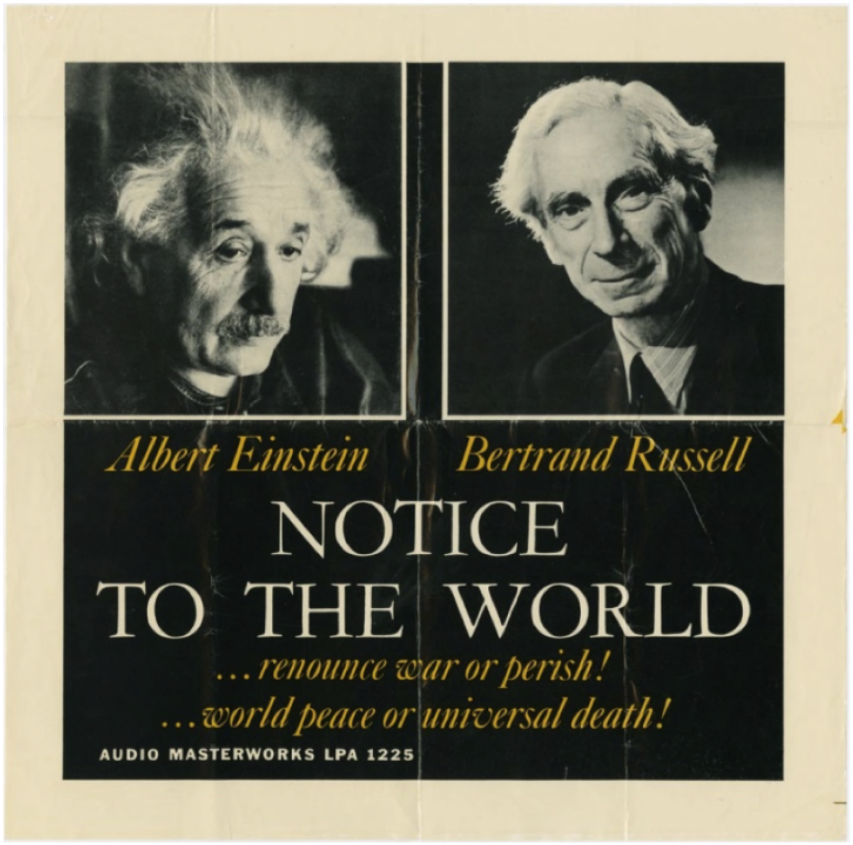
WARFARE

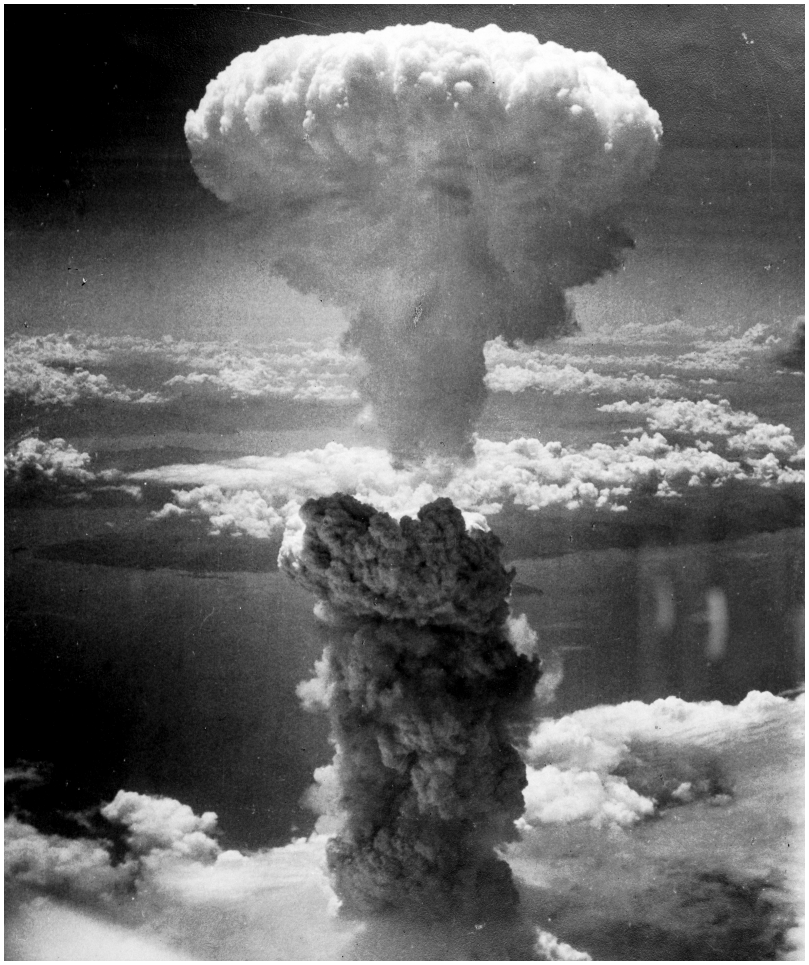
DoD Project Maven

- 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

Einstein & Russell





Source: FPIF, Wikipedia

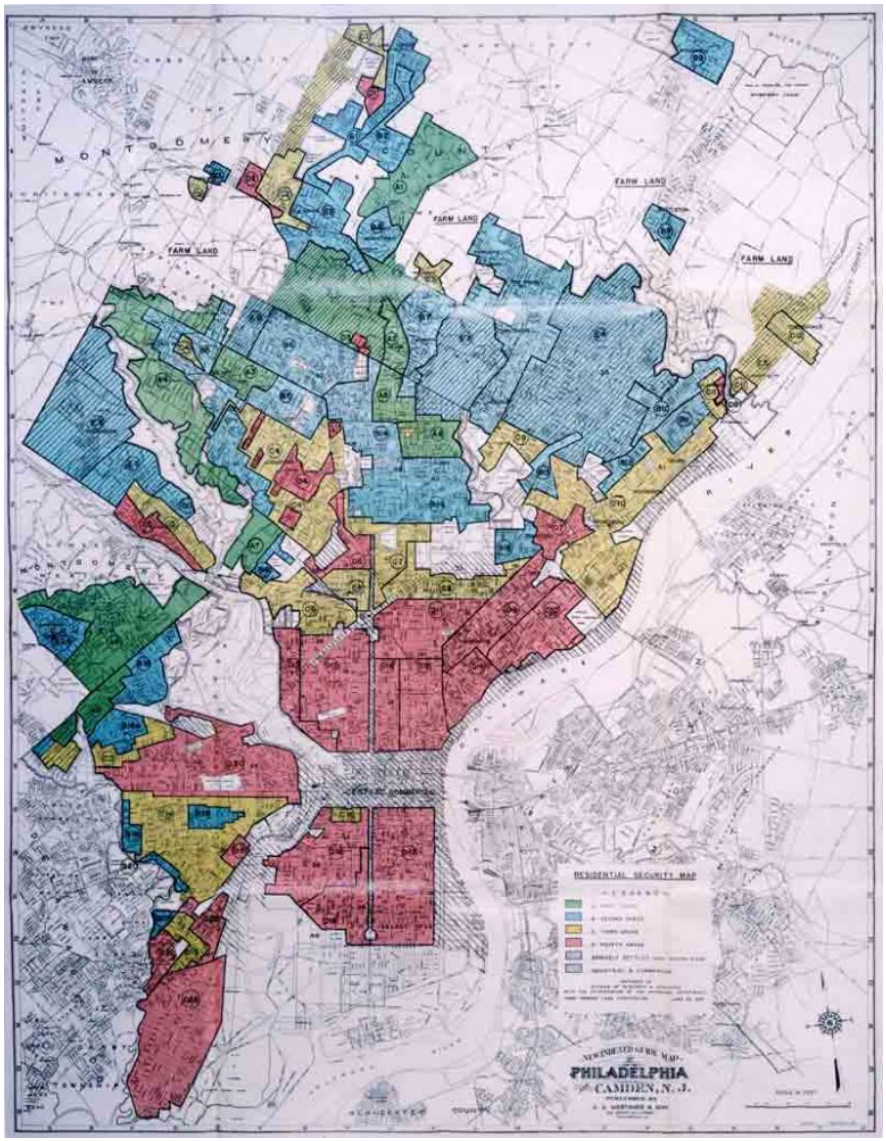
Ethical Issues

- 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

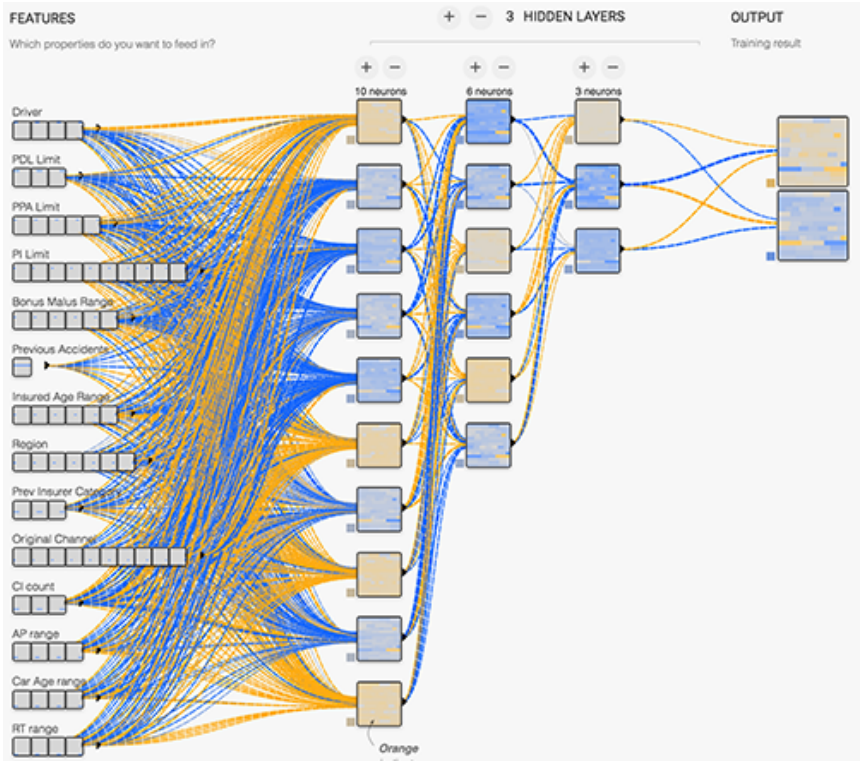
- In 1930s, the US FHA set up various mortgage assistance programs
- But decisions were made using maps that tightly correlate with racial identity
- Effects: increased segregation, urban decline



Source: Wikipedia

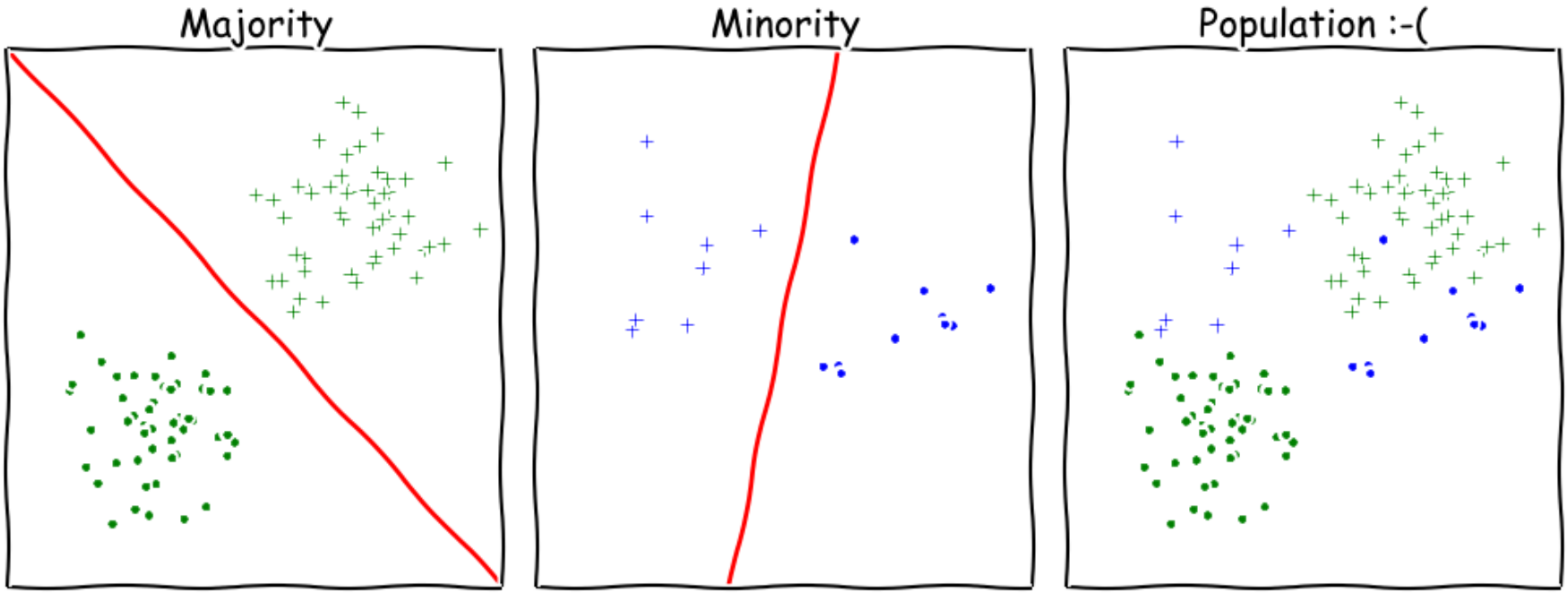
Deep Learning to the Rescue?

- Many companies are shifting to automated, data-driven decision processes
- Algorithms will soon be making decisions about:
  - Insurance rates
  - Mortgage eligibility
  - Hiring



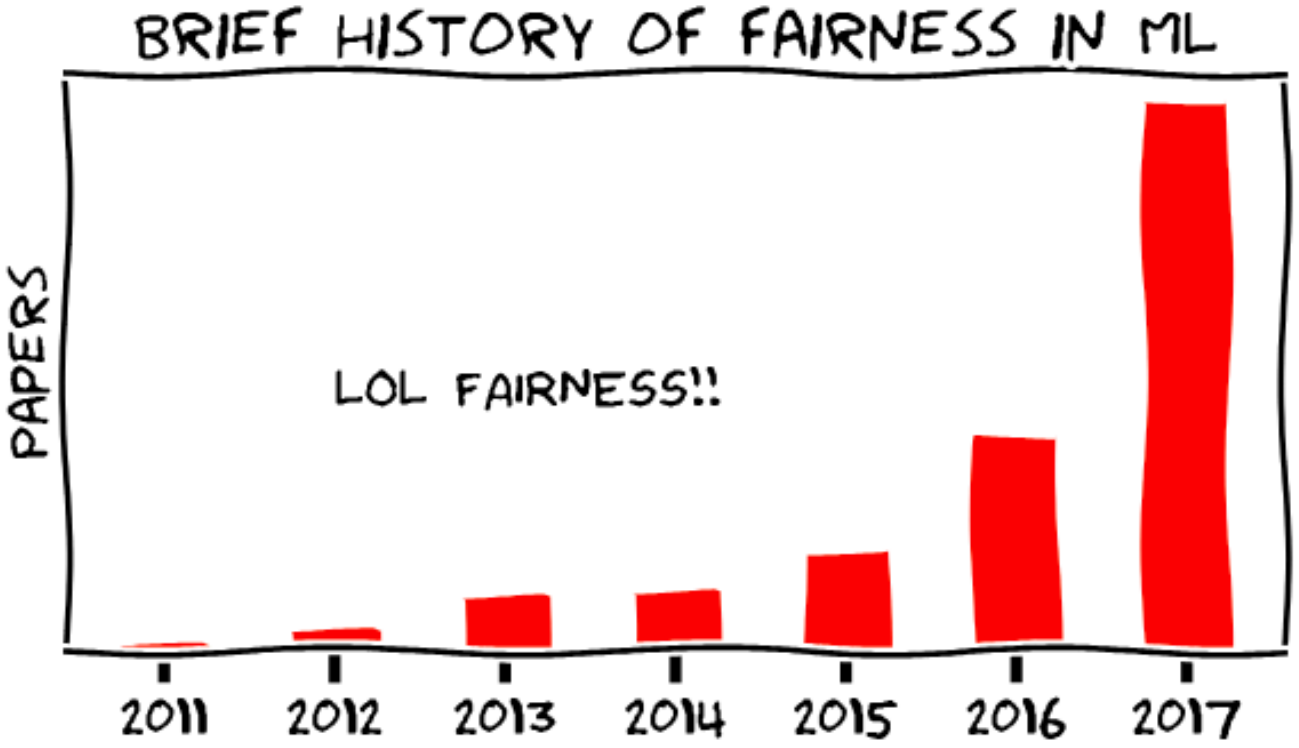
Source: Google Cloud

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