CPSC 430
Computers & Society

Class 5C: Work & Wealth (Chp 10) & Computer Reliability (Chp 8)

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Slides courtesy of Dr. Kevin Leyton-Brown

Class Outline

1. Announcements (5 mins)
2. Computer Reliability (50 mins)
3. Break (10 mins)
4. Work & Wealth (50 mins)
    - Break (10 mins)
5. Reminders before next class (5 mins)

Announcements

Computer Reliability

Computer Reliability

- Data-Entry and Retrieval errors
  - Voter logs
  - Long gun registry
  - False arrests
  - Credit records

- *What responsibility does the maintainer of a database have for the integrity of the data in it? What rights should the people about whom data is stored have to access it, and to have the data corrected?*
- *There is a trade-off between making a crime database more extensive and more accurate. How should this trade-off be managed?*

Dataset errors – protected words and invalid characters

- In 2016, a security researcher from California named Joseph Tartaro decided to get a vanity license plate. His choice: NULL
- He low-key hoped that would get him out of tickets, since NULL means "undefined" in many databases
- He ended up collecting fines for all people with missing license plates ($12,049 total)
- Christopher Null, a journalist for WIRED, commented: "He had it coming"
- Sources:
  - https://radiolab.org/episodes/null
  - https://www.wired.com/story/null-license-plate-landed-one-hacker-ticket-hell/

Software and Billing Errors

- System Malfunctions
  - Huge bills in the mail
  - Errors in government statistics
  - Mail undelivered
  - Rent system charged people too much
- System Failures
  - 911 system had huge delays
  - Errors in stock exchange platforms
  - Air traffic control systems
  - Emergency room scheduling systems
  - Airline scheduling software crash leads to 1100 canceled flights
  - Boeing 777 autopilot malfunction led to erratic flying
    - More recently, Boeing had issues with their MAX model and MCAS software
    - https://en.wikipedia.org/wiki/Maneuvering_Characteristics_Augmentation_System

Embedded Systems

- Patriot missiles
  - Accumulating floating point truncation errors led them not to fire at incoming missiles
- Ariane 5
  - Floating point to integer conversion error led rocket to explode
- Mars climate orbiter
  - Imperial/metric unit conversion led to crash
- Denver International Airport
  - $311 million automated baggage system never worked, eventually replaced with a $71 million traditional system
- Tokyo stock exchange
  - Accepted an order for selling 610,000 shares at 1 yen, instead of 1 share at 610,000 yen. Then wouldn’t cancel the order.

More Embedded Systems

- Electronic Voting Machines
  - Fails to record various ballots
  - Records way too many votes
  - Records way too few votes
  - Votes recorded correctly but counted wrong (integer overflow)
  - Votes were changed at the confirmation screen
- Therac-25
  - A linear accelerator used to for cancer radiation therapy
  - Occasionally gave patients way too much radiation
  - Traced to various software errors, including two race conditions

- *How much should be done to prevent such problems?*
- *How should we decide that a system is safe?*

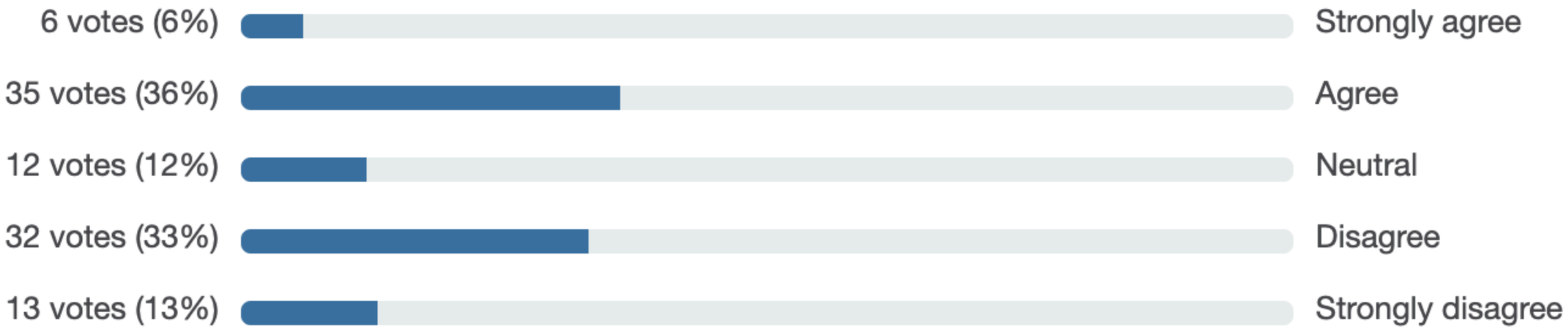
Self driving vehicles

- SAE International:
  - SAE Level 0 – No Automation
  - SAE Level 1 – Driver Assistance (adjustments to steering or acceleration/deceleration)
  - SAE Level 2 – Partial Automation: (adjustments to both steering and acceleration/deceleration)
  - **SAE Level 3 – Conditional Automation: "the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene"**
  - SAE Level 4 – High Automation: automated driving system with occasional requests for intervention from the human driver (not crucial)
  - SAE Level 5 – Full Automation

- SAE level 3 creates the "hands off problem"; Ford, Volvo and Google decided to skip this step. Do you agree?
- Do you agree with Quinn's assessment that Tesla Motor is partially responsible for Joshua Brown's death?

Computer Reliability

"Self-driving cars should be allowed to operate on public roads once they have been shown to be at least slightly safer than the average human driver."



Computer Simulations

- Simulations are used to answer questions about scenarios that can’t be easily observed in the real world
  - Hurricanes
  - Nuclear explosions
  - Climate change
  - Car crashes
- Models are only useful if they accurately describe reality

- *What would you need to see to trust a simulation?*
- *How accurate does a simulation have to be to be useful?*

Software Warranties

- Software companies tend to write license agreements saying that the software may not perform as promised
  - "we expressly disclaim … the implied warranties of merchantability and fitness for a particular purpose"
- Why is this reasonable?
  - Software is expensive
  - Other expensive goods are backed up by warranties

- *Should software come with warranties? If so, what should these warranties cover?*
- *Do software makers have a moral obligation to produce software that does what it promises?*

Break

Work & Wealth

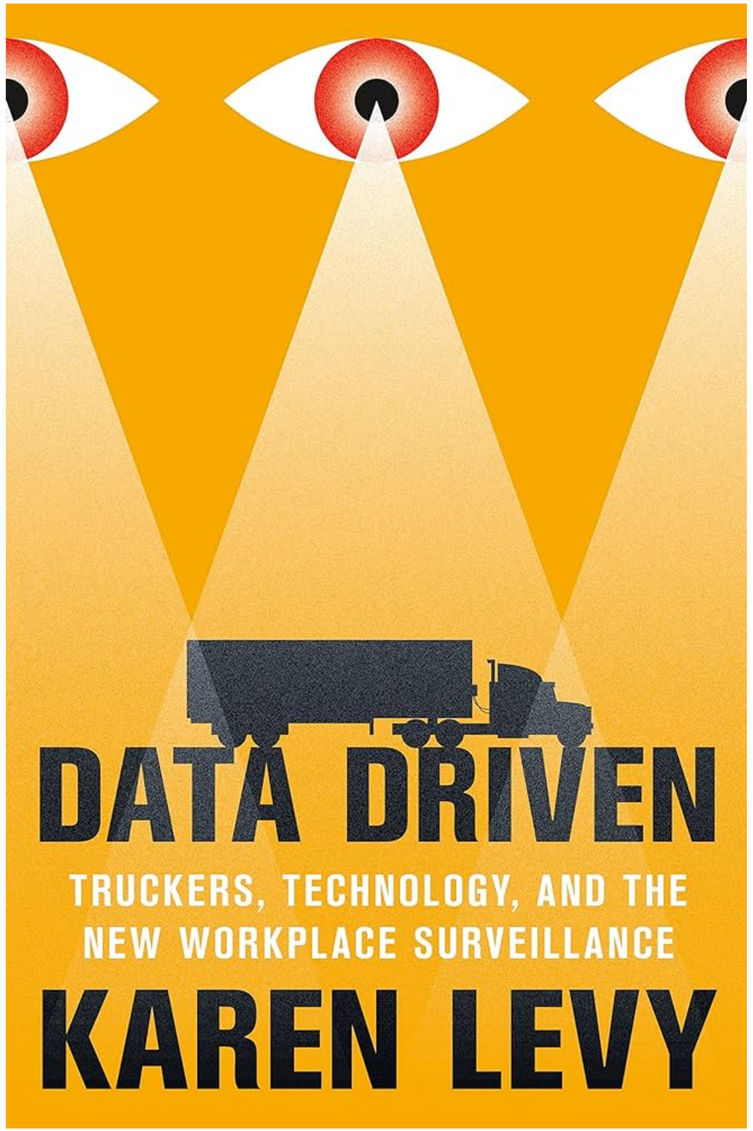
Workplace Changes

- Technology has fundamentally changed workplace organization
  - Flattening out organizational structures: reporting occurs between affected people rather than along predefined paths
  - Facilitating the monitoring of employees
    - Slacking off at work
    - Illegal activities by employees
  - Allowing telecommuting
    - Really accelerated changes due to COVID
    - Work/home line is blurred
  - Unpredicted effects of technological advances
    - Example: email
    - Initially designed to replace mail, it actually resulted in a massive increase in communication volume
- *How do you feel about these changes?*
  - *Do you think they improve or degrade employee experience?*

Increase in Productivity

- Working long hours
  - North Americans (particularly Americans) work longer hours than other cultures and other times in history
- Protestant Ethic and the Spirit of Capitalism
  - A famous explanation of this restless work ethic
  - Linked it to Calvinist theology of predestination
- We have exchanged leisure time for possessions
  - *Do you think this exchange is worth it? Would you exchange a much lower standard of living for much more free time?*

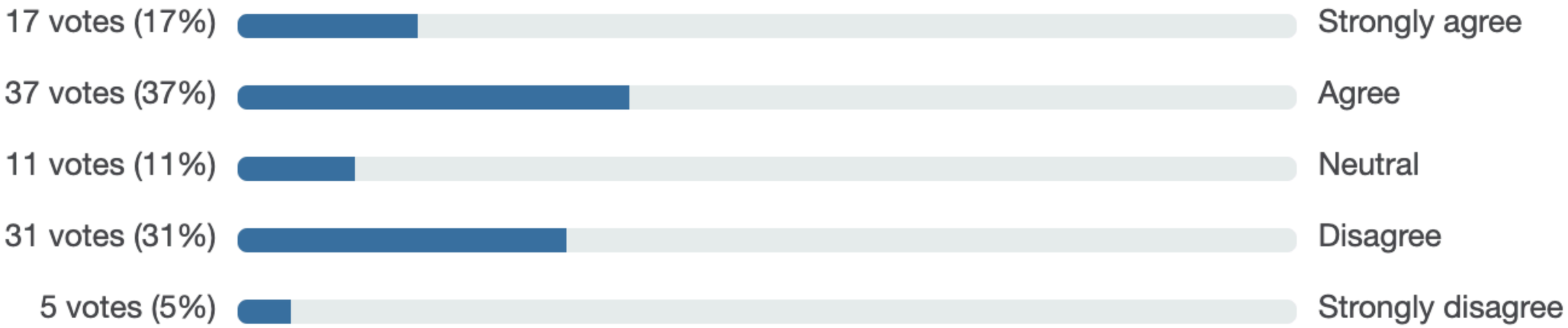
Example of increased monitoring



- Long-haul trucking is a hard job; because of its structure, drivers are incentivized to work for long hours
- Truckers' work time has been regulated, in some form or another, since the 1930s, but it wasn't strongly enforced
- Electronic logging devices (ELDs) were introduced to increase enforcement of hour limits (effective since 2017)
- Truckers strongly object it
  - It is an affront to their privacy, dignity, and independence
  - It encourages dangerous practices, such as resting on the highway shoulder if the rest station is full
- Ultimately, ELDs increased compliance, but not safety!

Work and Wealth

The activity of a company's employees on their computers, such as what applications they have opened and for how long, is private and should never be tracked.



Globalization

- The marketing of goods and services across global rather than national scales
  - Manufacturing goods in China, often using Canadian or Australian raw materials, often designed elsewhere
  - Call centers in India
  - Most chips are made in Taiwan
- Effects of globalization
  - Increased shipping and travel
  - Foreign workers (visas), students
  - Outsourcing

- *Do you think globalization is a problem or a benefit?*

Break

LLMs in the workplace

OpenAI report:

- How “exposed” are different occupations to automation with large language models (LLMs)?
- ~80% of the US workforce could have at least 10% of their work tasks affected by LLMs
- ~19% may see at least 50% of their tasks impacted
- Most affected tasks: writing and programming.
- Higher-income jobs (such as translators, tax consultants, and web designers) potentially face greater exposure

GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models

Tyna Eloundou, Sam Manning, Pamela Mishkin, Daniel Rock

We investigate the potential implications of large language models (LLMs), such as Generative Pre-trained Transformers (GPTs), on the U.S. labor market, focusing on the increased capabilities arising from LLM-powered software compared to LLMs on their own. Using a new rubric, we assess occupations based on their alignment with LLM capabilities, integrating both human expertise and GPT-4 classifications. Our findings reveal that around 80% of the U.S. workforce could have at least 10% of their work tasks affected by the introduction of LLMs, while approximately 19% of workers may see at least 50% of their tasks impacted. We do not make predictions about the development or adoption timeline of such LLMs. The projected effects span all wage levels, with higher-income jobs potentially facing greater exposure to LLM capabilities and LLM-powered software. Significantly, these impacts are not restricted to industries with higher recent productivity growth. Our analysis suggests that, with access to an LLM, about 15% of all worker tasks in the US could be completed significantly faster at the same level of quality. When incorporating software and tooling built on top of LLMs, this share increases to between 47 and 56% of all tasks. This finding implies that LLM-powered software will have a substantial effect on scaling the economic impacts of the underlying models. We conclude that LLMs such as GPTs exhibit traits of general-purpose technologies, indicating that they could have considerable economic, social, and policy implications.

🚩 The report answers the question “which jobs do **people think** LLMs will automate” and not “which jobs will LLMs automate”.

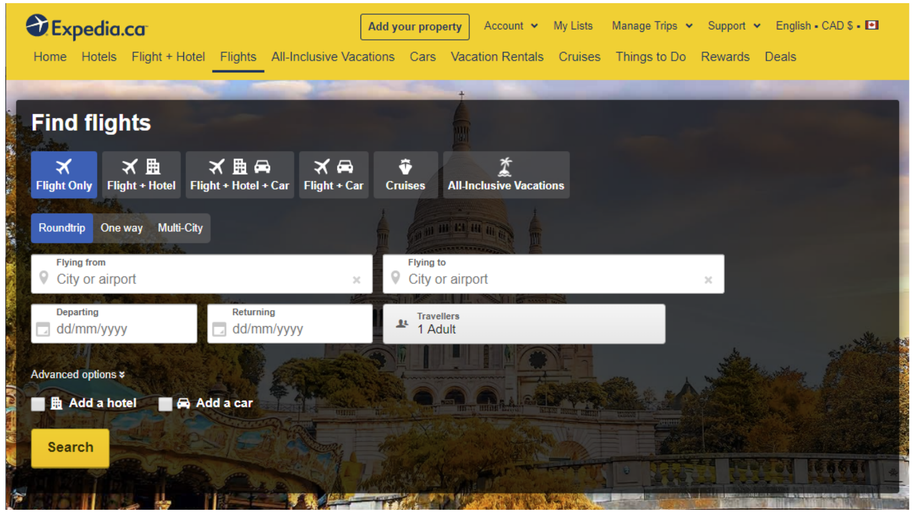
LLMs in the workplace

- Adoption of Large Language Models for various tasks, including work-related ones
  - Some people compare it to the advent of Google
  - Some issues (ownership of training data, allucinations...)

- Have you used LLMs before?
- Do you think LLMs should be used in the classroom? How?
- Do you think that AI will increase the expectations from professionals in the workforce? How?

Economic Impact

- Likely impacts:
  - Increased mechanization of **routine labor**
  - Automation of lower-end **knowledge work**
- Automation is nothing new
  - like other waves of innovation, AI will almost certainly make society as a whole **much richer**
  - but, it may also exacerbate **income inequality**
- What will this mean for the economy of the future?
  - **Post-scarcity** economy?
  - Human labor as a **luxury good**?



The “Winner-Take-All Society”

- Occurs when a small number of top performers receive a large fraction of the rewards
  - Athletes, musicians, actors, law schools, social media
- Harmful effects
  - Reduces the production of (e.g., cultural) goods
  - Unfair: severe penalty for falling a bit short
  - Leads to arms races
- What can be done?
  - Legal limits (e.g., working hours) to limit arms races
  - Cooperative agreements (e.g., cap on salaries in sports league)
  - Progressive taxation
- Beneficial effects
  - Why shouldn’t we watch the best actors, athletes, etc?
  - I enjoy reading the same books as my friends (network effects)
  - Maybe a slightly better CEO (lawyer, etc.) really does make a huge difference to my company

Inequality

Let’s try a class debate:

“It is immoral for a corporation to pay its CEO 400 times as much as a production worker.”

For

Against

Reminders before next class