CIS 381: Social & Ethical Issues of Computing

Automation

Dr. David Koop
Computer Simulations

- Simulations replace physical experiments
  - Experiment too expensive or time-consuming
  - Experiment unethical
  - Experiment impossible

- Verification: Does program correctly implement model?

- Validation: Does the model accurately represent the real system?
Software Engineering

• Software engineering is an engineering discipline focused on the production of software, as well as the development of tools, methodologies, and theories supporting software production

• Four-Step Process:
  - Specification: requirements & mockups
  - Development: detailed design & implementation
  - Validation: test against specification & for usability
  - Evolution: updates as required
Gender Bias

• In male-dominated fields, unconscious gender bias can affect important design decisions
  - Example: seatbelts don’t work well for pregnant women and their unborn children because crash dummies are modeled after men
• Men and women have different approaches to writing and debugging software and using programming tools
• Even if women present, their voices may not be heard
  - Voting suppresses minority views
  - Many decisions made under time pressure
• Solutions
  - Attract more women by improving job postings
  - Assign mentors, eliminate sexual harassment
Software Warranties

• Shrinkwrap Warranties:
  - Some say you accept software “as is”
  - Some offer 90-day replacement or money-back guarantee
  - None accept liability for harm caused by use of software

• Are Software Warranties Enforceable?
  - Mass-marketed software and software included in sale of hardware likely to be considered a good (not product) by a court of law
  - Uniform Commercial Code applies to goods, despite what warranties may say
Therac-25

• AECL and CGR built Therac-6 and Therac-20
  - PDP-11 was part of system, but not required
• Therac-25 built by AECL
  - PDP-11 an integral part of system
  - Hardware safety features replaced with software
  - Reused code from Therac-6 and Therac-20
• Race condition: order in which two or more concurrent tasks access a shared variable can affect program’s behavior
• Two race conditions in Therac-25 software
  - Command screen editing
  - Movement of electron beam gun
Moral Responsibility of the Therac-25 Team

- **Conditions for moral responsibility**
  - Causal condition: actions (or inactions) caused the harm
  - Mental condition
    - Actions (or inactions) intended or willed -OR-
    - Moral agent is careless, reckless, or negligent

- **Therac-25 team morally responsible**
  - They constructed the device that caused the harm
  - They were negligent
Continued

• Computer errors related to radiation machines continue to maim and kill patients

• New York Times investigations

• “As Technology Surges, Radiation Safeguards Lag” by Walt Bogdanich
  - "Over the last two decades, the industry has developed generations of machines, each designed to more precisely attack tumors, allowing doctors to administer higher doses of radiation with less risk to healthy tissue."
  - "More than 300 patients in four hospitals — and possibly many more — were overradiated by powerful CT scans used to detect strokes"
  - Many other terrible stories of issues with radiation doses

[W. Bogdanich]
"Scientific societies haven’t been able to keep up with the rapid pace of technical improvements"
—Jeffrey F. Williamson
Term Paper

• Presentation dates to be announced soon
• Term papers are individual
• Topic presentations are done in groups, but each person should speak for 3-4 minutes
• Individual term papers are due May 6 (assigned exam date)
• Need to evaluate issues using ethical frameworks
• Groups can choose to examine different issues related to a topic or examine a similar issue using different frameworks
Impacts of Technology

- Information technology and automation affecting workplace
  - Increases in productivity
  - Globalization of job market
  - Organization of companies
  - Telework
  - Workplace monitoring
- Impacts of information technology on society
  - Digital divide
  - Winner-take-all effects
Automation and Employment

• Automation causes the loss of jobs
• Automation causes the creation of jobs
Automation and Job Destruction

• Between 1979 and 2011…
  - U.S. population increased 39%
  - Manufacturing employment dropped 40%, from 19.4 million jobs to 11.7 million jobs
  - General Motors exited bankruptcy in 2009 with 30% fewer employees

• Lost white-collar jobs
  - Secretarial and clerical positions
  - Accountants and bookkeepers
  - Middle managers

• Layoffs increase stress on remaining workers

• Work week got longer between 1979 and 1990 [J. Schor]

[M. J. Quinn]
Automation and Job Creation

• Automation lowers prices
• That increases demand for the product
• It also increases real incomes, increasing demand for other products
• Increased demand → more jobs
• Number of manufacturing jobs worldwide is increasing
• Workers today work less than workers 100 years ago [M. Carnoy]
Automation Can Create Jobs, Too

Automation → Eliminates jobs

Reduces price of product → Increases demand for product → Creates jobs

 Increases real incomes of consumers → Increases demand for other products

[M. J. Quinn]
Effects of Increase in Productivity

• We have used higher productivity to achieve a higher material standard of living
• This is in contrast to medieval or ancient times (before modern capitalism)
  - Low caloric intake meant pace of work was slow
  - Work was seasonal and intermittent
  - Laborers resisted working if they had enough money (i.e., they weren’t consumers)
  - When wages rose, laborers worked less
In the News
In the News

• "We should not be haunted by the specter of being automated out of work. We should be excited by that. But the reason we’re not excited by it is because we live in a society where if you don’t have a job, you are left to die. And that is, at its core, our problem."

• "We should be excited about automation, because what it could potentially mean is more time educating ourselves, more time creating art, more time investing in and investigating the sciences, more time focused on invention, more time going to space, more time enjoying the world that we live in."
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— Alexandria Ocasio-Cortez, SXSW
Robot Tax

• Warehouse work and driving likely to be left to robots in the next 20 years
• “You ought to be willing to raise the tax level and even slow down the speed [of automation]” — B. Gates
• Humans are taxed on their earnings, why not tax robots?
• Use taxes to support initiatives like reaching out to the elderly, having smaller class sizes, helping kids with special needs
Case Study: The Canceled Vacation

- Stuart is a software developer for Seattle start-up
- Everybody works 60 hours/week
- Company’s vacation policy is 3 weeks/year
  - Nobody takes that much
  - Some of Stuart’s coworkers have had zero vacation in 2+ years
- Six months ago, Stuart learns his parents are moving from San Diego to Australia
  - He gets permission for one week’s vacation in San Diego
  - Doesn’t tell parents
Case Study: The Canceled Vacation

• One week before vacation, supervisor asks Stuart to delay vacation
  - Important product update
  - Offers Stuart three weeks’ vacation next year and round-trip airfare to Australia
• Stuart agrees to request and cancels vacation to San Diego
Kantian / Social Contract Theory Evaluation

• Stuart broke no promises and didn’t deceive anyone
• Stuart was not obligated to visit his parent before they moved from San Diego to Australia
• Stuart did nothing wrong
Act Utilitarian Evaluation

• Stuart had two alternatives: accept or reject supervisor’s request
• Consider duration, certainty, propinquity, and purity of two alternatives
• Duration
  - San Diego: 1 week
  - Australia: 3 weeks
  - Trip to Australia 3 times better
• Purity
  - San Diego: Will be worrying about upset boss
  - Australia: Realistically, will also be worrying about upset boss
  - Two options equivalent
Act Utilitarian Evaluation

• Propinquity
  - San Diego: Next week
  - Australia: Next year
  - Trip to San Diego much better (2 times better)

• Certainty
  - San Diego: 100%
  - Australia: Much less certain, given history of Stuart’s manager and fact no one has ever taken 3 weeks’ vacation, say 25%

• Summary:
  - San Diego: $1 \times 1 \times 2 \times 100\% = 2$ (better)
  - Australia: $3 \times 1 \times 1 \times 25\% = 0.75$
  - Stuart made the wrong decision
Virtue Ethics Evaluation

• Stuart demonstrated a lack of courage and a lack of consideration for himself, his coworkers, and his parents

• By caving in to his boss
  - he let his boss get away with bad behavior
  - he made reasonable vacations less likely for himself and for his fellow employees
  - he deprived his parents of the pleasure of his company for at least a year

• Stuart’s decision is not characteristic of a good co-worker or a good son
Rise of the Robots?

• Some experts suggest most jobs will be taken over by machines

• Artificial intelligence: Field of computer science focusing on intelligent behavior by machines

• Rapid increases in microprocessor speeds have led to various successes in AI

• What will happen as computers continue to increase in speed?
Notable Achievements in AI since 1995

• IBM supercomputer Deep Blue defeated chess champion Gary Kasparov in 1997
• Honda’s ASIMO android climbed and descended stairs (2000)
• Electrolux introduced robotic vacuum cleaner in 2001
• Watson trounced two most successful human Jeopardy! champions in 2011
• Deep Learning
Autonomous Vehicles

- Computer-controlled minivan “drove” on freeways across USA in 1995
- Five autonomous vehicles successfully completed 128-mile course in Nevada desert in 2005
- Google’s self-driving cars logged more than one million miles between 2009 and 2015 without an accident (caused by the car)

[J. Green] [M. J. Quinn]
Moral Question Related to Robotics

- Is it wrong to create machines capable of making human labor obsolete?
- Would intelligent robots demoralize humanity?
- Is it wrong to work on an intelligent machine if it can’t be guaranteed the machine will be benevolent toward humans?
- What if a human puts intelligent machines to an evil use?
- How would creative computers impact intellectual property?
- How will our ideas about privacy change if superfast computers constantly analyze our electronic records?
Personal AI

• Making an AI that is conscious of its own existence

• Morally acceptable to attempt the construction of a personal AI?
  - Fully conscious AI unlikely to accept status as property
  - Owning AI would be a form of exploitation

• Should personal AI have the same rights as humans?

• If an AI doesn't have free will and cannot make moral choices, perhaps this is morally acceptable