CMPT 320: Social Implications of a Computerized Society

A Course Overview

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Contents

1 Introduction

- Positive impacts of development:
  - Improved quality of life (e.g. ability, convenience, efficiency)
    - E.g. Travel, communication
  - Reliability of work
  - New types of jobs
- Negative impacts of development:
  - Job loss
  - Increased ability to exploit, damage, and perform criminal acts
  - Physical and mental health deficiencies
  - Higher possible error rates/severities due to complexity
  - **Externality:** An unintended side effect on an unrelated party

1.1 Case Studies

- Cell phones:
  - Currently over 5 billion devices worldwide
  - Benefits:
    - Ease of communication
    - Access to information
    - Remote management or manipulation of assets
  - Problems created:
    - Loss of privacy due to location tracking
    - Loss of concentration
    - Usage during driving
    - Ease of communication for criminal parties
- Social networks:
  - Benefits:
    - Share information
    - Connect people/organizations
    - Organize and recruit people remotely
    - Crowd-funding abilities
  - Problems created:
    - Cyber-bullying
    - Loss of privacy
    - Correlation with decrease in mental health
- Internet communication:

  - Benefits:
    * Read when convenient
    * Time-efficient
    * Many options for communication
  - Problems created:
    * Computer crime
    * Loss of privacy
      - Facilitates government surveillance
    * Enables violation of copyright
    * Decrease in customer service
- E-commerce:
  - Benefits:
    * Allows remote auctions and sales
    * Facilitates peer-to-peer sales
    * Increases supply
  - Problems created:
    * Concerns about trusting financial details online
    * Untrusted sellers
- Benefits of technology in medical computing:
  - Pacemakers
  - MRI and CT scans
  - Joystick surgery
  - Telemedicine
  - Record keeping and access
- Benefits of technology in reducing paper use:
  - Digital documents sent and received
  - Editable documents
  - Storage is reusable
- Challenges of new technology:
  - Problem and solution is natural
  - How to approach old problems in a new context
  - Trade-offs (e.g. security vs. convenience)
  - How to adapt to new technology
  - Governance of technology usage or prevention

2 Privacy

- **Privacy:**
  - Core aspects:
    - Control of your information and other entities publishing
    - Freedom from surveillance
    - Freedom from intrusion
- Threats to privacy:
  - External access (through theft, leakage, personal mistakes, etc.)
  - Inappropriate/nonconsensual surveillance
  - Intentional secondary usage by insiders with access
    - By private companies for uses such as marketing
    - By governments for uses such as law enforcement
- **Fair information principles:**
  - Information collection:
    - Inform people when collecting, about the content, and how it will be used
    - Data is accurate and secure
    - Only the data required
    - Data kept only while needed
    - Offer opt-outs
    - Develop policies for responding to law enforcement requests (e.g. see Twilio)
- Organizational privacy:
  - **Audit trail:** Record of who accessed what information when
  - **Chief Privacy Officer:** Company position which manages privacy policy and its application
  - **Privacy audit:** Scan for information leakage, privacy policy health and compliance, and other privacy-related issues

2.1 Legal Aspects

- Legal systems:
  - **Case law:** Legal system used by England in which laws are general principles and judges rule on details for applying a law
  - **Positive law:** Legal system used by many European countries in which rules cover as many specific situations as possible
- Legal documents:
  - US Constitution Amendment 4 protects against unreasonable search and seizure except upon a warrant with probable cause
  - Canadian Charter Clause 8 protects against unreasonable search or seizure
- **Secondary use:** Application of personal information to a different purpose than its collection purpose

- **Free market viewpoint on privacy:** Users should have access to informed consent and freedom of choice to use of their information in exchange for benefits/services
  - E.g. Companies inform users about secondary uses and obtain informed consent, trading benefits for personal information
- **Consumer protection viewpoint on privacy:** Users have the right to privacy and are entitled to control over their information
- Information is generally protected when there is a reasonable expectation of privacy
- Canadian privacy laws vs. US:
  - More information control
  - More enforcement and regulation
  - Less governmental access
  - Provincial/federal Privacy Commissioners supervise activities
- European Union privacy laws vs. US:
  - Stronger privacy protections
  - Sending European personal data to US requires US recipient to follow Privacy Shield rules
  - **Right to be Forgotten:** European Court of Justice decreed that a person can require companies to remove links to certain kinds of personal information
- Related acts and legislations (in alphabetical order):
  - **Bill C-51 (2015, Canada):** Increased information access by law enforcement
  - **Communications Act (1934):** Interception of messages not allowed
  - **Communications Assistance for Law Enforcement Act by FCC (1994):** Telecommunications must allow governmental interception
  - **Electronic Communications Privacy Act (1986):** Extended OCCSSA wiretapping laws to electronic communications; restricts government access to email
  - **Foreign International Surveillance Act (1978):** Rules on communications between Americans and foreigners
  - **Omnibus Crime Control & Safe Streets Act (1968):** Electronic surveillance by law enforcement with court order allowed
  - **Personal Information Protection and Electronic Documents Act (Canada)**
  - **Privacy Act (Canada):**
    - Restricts governmentally-collected data to only that which is relevant and necessary
    - Requires government notice of record system
    - Allows access of your own records and correction of inaccurate information
    - Requires procedures to secure data
    - Prohibits unconsented information disclosure
  - Unnamed (2009): International call surveillance without court order allowed

3 Ethics

- **Fundamental ethical principles/frameworks:** Ethical systems by which to judge the morality of an act
- **Universalizability:** Judging an act by the theoretical consequences of everyone performing that act
  - **Immanuel Kant's categorical imperative:** Act according to the maxim that you would wish all other rational people to follow, as if it were a universal law
- **Consequentialism:** Judging an act purely by the resulting consequences, rather than a sense of intrinsic duty or the character of the behaviour
  - **Utilitarianism:** Judging an act by maximizing the consequences, defined in terms of the sum of the individual utility to specific parties
    - Not based on selfish motivations; calculated with greater good
    - To evaluate, use an arbitrary quantitative analysis of utility for each party (e.g. see table 1)

Table 1: Utilitarian Analysis of Killing Hitler

	Entity			
Options	You	Hitler	Rest of the World	Total
Shoot	100	-1000	100,000	99,100
Don't shoot	-100	0	-100,000	-100,100

- **Deontology:** Judging an act purely by a sense of intrinsic duty and the character of the behaviour, rather than the resulting consequences
  - Associated with basic rights
  - E.g. The Ten Commandments are intrinsic behavioural rules
  - Immanuel Kant's deontic morality: Using the categorical imperative and our reasoning to determine morality and to treat people as ends, not means
- **Fairness:** Judging an act by the equality of how people are treated
  - **Equality:** Distribution which is quantitatively the same for each entity
  - **Need:** Distribution based on what each entity requires or is lacking
  - **Merit/equity:** Distribution based on the effort and contribution by each entity
- **Social contract:** Agreement for the rules of a group of people, made between rational people who are free not to join
  - **Veil of ignorance:** Concept of decision-making while imagining they do not know anything about their own characteristics in a social order
    - Preserves impartiality
- **Rights-based:** Basic system of rights and freedoms relating to yourself or others
  - **Negative right:** Entitlement to act freely without interference (e.g. freedom of speech or assembly)
  - **Positive/claim right:** Entitlement to a service or benefit (e.g. health care, education)
- **Canadian Charter of Rights and Freedoms** protects the freedoms of:
  - Conscience and religion

  - Thought, belief, opinion and expression, including freedom of the press and other media of communication
  - Peaceful assembly
  - Association
- **UN Declaration of Child Rights** upholds the principles that a child shall:
  - Be given opportunities to develop physically, mentally, morally, spiritually and socially in conditions of freedom and dignity
  - Be entitled from his birth to a name and nationality
  - Enjoy the benefits of social security
  - Be given care including prenatal and postnatal care
  - Be provided with nutrition, housing, recreation and medical services

4 Freedom of Speech

- **Freedom of speech:** Ability to express opinions without restraint
  - Distinguished from action (e.g. inciting illegal acts, libel, or threats are not allowed)
  - **Chilling:** Inhibition of a natural or legal right
    - Laws cannot chill charter rights such as freedom of speech
  - Allows discussing and debating to improve social welfare
  - Be minimally restrictive (e.g. adults should not be restricted to child-appropriate content)
- Software protection:
  - In 1990s, US government restricted publishing encryption software; judge decided that the source code was classified as speech
- **Publisher/broadcaster:** Service which creates and manages content
  - Liable for content
  - Holds the right to freedom of expression and right not to publish
- **Common carrier:** Service which hosts content or provides benefits from other entities
  - Not liable for content
  - Is required to give universal access
- Generally, providers are not liable for illegal uses as long as the service has substantive legal use
- Improvement in technology and stronger government presence allows for greater censorship
- **Spam:** Unwanted targeted electronic communication
  - Free speech is not an issue
  - Possible economic method for deterrence: Charging a sender to pay
    - Deters lower-income groups
  - Technological method for deterrence: Filters
  - Can-Spam bill by US Congress: Requires opt-out option, cannot disguise *From* field

5 Intellectual Property

- **Intellectual property:** Right to owning the underlying concept of a creation
  - Positive right (see Positive/claim right)
  - Contrasted with the owner of a product having a negative right and property right over their physical copy
- **Copyright:** Automatic exclusive legal right to (re)produce, distribute, create derivatives of, and perform work (i.e. the expression of the idea)
  - Protects creative works and creative expression (but not the physical copy)
  - Promotes innovation by allowing creator to benefits
  - Expires over time and work enters public domain
  - E.g. Books, articles, movies, songs, art
  - Does not protect facts, concepts, processes, algorithms, ideas
  - Enforcement tactics:
    - Software: Activation numbers, expiration dates, DRM
    - Suing ISPs with subscribers who violate copyright
    - Suing new technology to suppress or delay it (e.g. CD burners)
    - Taxing products which can make copies
  - EU approved copyright law requiring media platforms to detect copyright material using filters during upload
  - Modern software alternatives to copyright:
    - Open source, freeware, shareware
    - Licences (e.g. Creative Commons)
    - **Copyleft:** Right to use, modify, and distribute software as long as the same permissions are given to their products
- **Patent:** Approved right to make, use, and sell an invention
  - Laws of nature/mathematics cannot be patented
  - Software can be patented (e.g. encryption, compression, copy protection)
  - E.g. A CPU with a specific architecture, a phone with a specific screen design, one-click shopping, personalized product recommendations, privacy controls
  - Cons: New innovations are only usable by one group; new products have difficulty avoiding infringement
- **Fair use:** Limited ability to use copyrighted material without permission
  - 4 key factors:
    - Purpose (must be educational, not for profit)
    - Nature of work (fiction vs. factual report)
    - Amount and substantiality
    - Effect on value or potential market
  - E.g. Criticism, parodies, news, teaching, research

– Arguments against international patent enforcement to support global development

6 Life With Technology

- **Luddite:** People who burned factories due to losing their jobs in the 1800's Industrial Revolution in England
  - **Neo-Luddite:** People who disagree with technology
    - Reasons:
      - Unemployment
      - De-skilling
      - Removal of social structure
      - Social isolation
      - Lack of intellectual development
      - Environmental damage
      - Largest benefits to businesses and governments
- Information on the internet:
  - Increased information consumption
  - Ability to be selective with news
  - Fake news and external manipulation (e.g. fake websites by Macedonian teenagers in 2016 US presidential election, Facebook removal of pages during 2018 US midterm elections)
  - Comment moderation is difficult, expensive, and biased
  - 10-point loss in IQ due to distractions by emails and phone calls; check phones every 12 minutes on average
- Computers in community:
  - Efficient surface-level communication and connections
    - Greater quantity, less quality
    - Difficult to develop trust (less time off-line)
  - Increased transparency and oversharing
  - Information available about a person is misleading
  - Facebook negatively associated with well-being (American Journal of Epidemiology)

7 Computer Crime

- Anonymity:
  - Allows impersonation and identity theft
  - Facilitates fraud, deception
- **Hacking:** Unauthorized access to a system
  - Possible differentiation between access and modification
  - E.g. Kevin Mitnick was imprisoned for social engineering, software copying, password theft
- **Virus:** Malicious program hidden within a file or program
  - E.g. Melissa was an email worm and virus distributed as an e-mail attachment which disabled safeguards in Word
  - E.g. Love Bug was an email worm and virus which caused billions of dollars in damage
- Methods of access:
  - **Social engineering:** Misleading people to voluntarily release information
    - **Phishing:** Request for sensitive information disguised as a legitimate message
  - **Backdoor:** Method of access designed by the creator
  - **Worm:** Self-propagating program which copies itself to other computers
  - **Trojan horse:** Malicious software which appears benign
  - **Bot/botnet:** Computer controlled by malicious software
- Purposes of a malicious program:
  - **Pharming:** DNS manipulation to change URLs to a false website
  - **Ransomware:** Malicious software which encrypts files and demands payment for decryption
  - **Spyware:** Malicious software which records user activities
- Miscellaneous areas of cybercrime:
  - White-hat, grey-hat, and black-hat
  - Political hacktivism
  - **Phone phreaking:** Hacking into the telephone networks for free calls, wiretapping, etc.
  - **Denial-of-service:** Attack which overloads a server with many requests
    - Hacker mafiaboy shut down websites such as Yahoo, eBay, Amazon
  - Identity fraud
  - Online market scams, auction fraud
  - Ad click fraud
- Security:
  - Methods: Firewalls, authentication and authorization, biometrics, encryption
  - Trade-off between security and convenience
  - Goals:
    - Confidentiality of private data

* Integrity of access only through authorization
* Availability of system and data when necessary

8 Computers in the Workplace

- Remote work/telecommuting:
  - Benefits for employees:
    - Flexibility in hours and locations
    - Increased productivity, satisfaction
    - No commuting expenses
  - Benefits for employers:
    - Less office space and equipment required
    - Allows work to continue regardless of weather
  - Benefits for society:
    - Less traffic, pollution, stress
  - Cons:
    - Difficulty in communication, coordination
    - Less loyalty
    - Unnatural work hours
    - Office space costs paid by employee
    - Security risks of personal and work material on same computer
- Issues created by techology in the workplace:
  - Increased distraction, anxiety, email load
  - Increased work load, possible sleep deprivation (average American worker puts in 200 hours more per year than in 1973)
- Employee crime:
  - **Embezzlement:** Theft of company property by an employee responsible for the property
  - **Logic bomb:** Software which destroys critical files or data after the departure of an employee
- Types of work and connections:
  - **Sharing economy:** Network of people providing goods and services (e.g. Craigslist, AirBnB, Car2Go)
  - **Contractor:** Temporary worker who is not entitled to employee benefits but may have higher pay
    - Company has relatively less responsibility to control and direct the operation of the task
- Miscellaneous effects of technology on work:
  - Ability to research company beforehand and apply remotely
  - Increased hiring screening
  - Ability to monitor employees during work through data entry, phone records, surveillance cameras
    - Rules against specific employee communications exist (e.g. working condition discussions, union activities, whistle blowing)
  - Ability to monitor employees' social media outlets and punish them for inappropriate behaviour

9 Economic Impact of Technology

9.1 Fundamentals of Economics

- Model of profit:
  - Market share $\times$ price = revenue
  - Revenue $-$ production costs $-$ input costs (e.g. labour, materials, machines) $-$ processing costs = profit
- **Productivity:** Output per input hour of work
- **Collusion:** Illegal secret agreement between two entities to limit competition
  - E.g. Silicon Valley's anti-poaching agreement
  - Legal penalties exist (e.g. Canada's Competition Bureau)
  - Legal alternative: Merging
    - Creates a monopoly
    - Decreases competition
    - Increases prices
- Median family income has increased by 10% from 2005 to 2015
- Natural monopolies:
  - Technology allows for greater networking abilities which may lead to first-mover advantages
  - Companies grow to dominate a market (e.g. Google)

9.2 Economic Models

- **Smith's ideal competitive market/free market/classical model:** Economic model driven by rational self-interest where:
  - All agents understand all possible products and prices,
  - No barriers to market entry exist, and
  - No transaction costs exist
- **Bertrand competition:** Economic model of competition where sellers setting prices and customer buying products creates an equilibrium of prices slightly above production costs
  - Any seller which sells below cost will lose money
  - Any seller which sells at cost will have no profits
  - Any seller which is undercut by another seller will have no market share and must match the price
  - Can be unbalanced by collusion
- **Marxist conflict due to the means of production:** Economic model in which those who contribute value to a product conflict on the share of profits
  - Means/factors of production include land, capital (e.g. money to purchase and maintain equipment), labour
  - Destructive class struggle between the advantageous owners of the capital and the workers who provide labour

- **Keynesian demand-side economics:** Economic model where increased spending creates increased income with which to spend more
  - Contrary to Bertrand's model, demand occurs externally and is not fixed
  - Feedback loop: Increased investment increases wages which increases demand which increases profit which increases investment
  - **Demand weakness:** Net saving in the economy which creates increased unemployment and triggers a recession
    - Should be fixed by government spending more and going into debt to create demand
      - E.g. Henry Ford raising wages
      - E.g. Roosevelt's New Deal
  - **Golden Rule:** Target of wages growing by productivity + inflation rate
- **Schumpeter's innovation and enterprise model:** Economic model where disruptive innovation against large entities is prioritized by economic policies to promote economic growth
  - Strengthens the first-mover advantage to create temporary monopolies
  - E.g. Apple's disruption of the cell phone market
  - E.g. Uber's disruption of taxi services

9.3 The Impact of Technology

- Less 'friction' in the market due to:
  - Lower transaction and processing costs
  - Greater connections between customers/vendors
- Globalization of employment:
  - **Outsourcing:** Contracting an external company to create components of a product or service
  - **Offshoring:** Moving business processes to other countries to reduce costs
  - **Inshoring:** Domestic workers being employed by a foreign company
- Production and employment changes:
  - **Job churn:** Period between 1993 and 2002 in the US when 310 million jobs ended and 328 million jobs were created (resulting increase of 18 million jobs)
  - Reduction of employment due to technology:
    - Agricultural workers
    - Telephone operators
    - Mid-level managers
    - Bank tellers
  - Technology eliminates dirty, dangerous, and/or difficult jobs
  - **Productivity paradox:** Increases in IT have not increased productivity or growth
    - **Parkinson's Law:** "Work expands to fill the time available for its completion"