CIS 381: Social & Ethical Issues of Computing

Technologies as Catalysts for Change

Dr. David Koop
“Technology is not neutral. The choices that get made in building technology then have social ramifications.”

— M. Sahami
The Moral Machine Experiment

What should the self-driving car do?

[E. Awad et al., Nature, 2018]
Course Material

- Course Website
  - **All** material will be posted there
  - myCourses for turning in assignments

- Textbook: *Ethics for the Information Age* by M. J. Quinn, 7th ed., 2017
  - Provides background on ethics
  - Covers major issues in computing and data science

- Assigned Readings
Grading

• Writing Assignments, Quizzes and Participation: 35%
• Tests (2): 35%
• Term Paper & Presentation: 30%
• Late Policy
Important Dates

- **Check these now!**
- Test 1: February 27
- Test 2: April 10
- Presentations: April 17–May 1
- Tests may not be rescheduled and can only be made up in case of a documented emergency.
Syllabus

• Do not plagiarize or otherwise cheat
• Check test dates
• Register on COIN if you haven't already
• See me about any accommodations
• Questions?
Assignment 1

• Link
• Read "Is Google Making Us Stupid?", N. Carr
• Write 250-300 words, approximately one half-page single-spaced in 12pt font, about the above subject
• Check spelling and grammar!
• Writing assignments are to be done individually
• Due next Wednesday (1/30) before class
• Turn in via myCourses
Advances in Computing
Aids to Manual Calculating

• Tablet
  - Clay, wax tablets (ancient times)
  - Slates (late Middle Ages)
  - Paper tablets (19th century)

• Abacus
  - Rods or wires in rectangular frame
  - Lines drawn on a counting board

• Mathematical tables
  - Tables of logarithms (17th century)
  - Income tax tables (today)

[© Science Museum Library, M. J. Quinn]
Cash Register

- Store owners of late 1800s faced problems
  - Keeping accurate sales records for department stores
  - Preventing embezzlement from clerks
- Response: cash register
  - Created printed, itemized receipts
  - Maintained printed log of transactions
  - Rang bell every time drawer was opened
Antecedents to the Personal Computer

- **Whole Earth Catalog**
  - “Sort of like Google in paperback form” (Steve Jobs)
  - Stewart Brand saw “technology as a tool for individual and collective transformation” (Fred Turner)

- **People’s Computer Company**
  - Educated people on how to use computers
  - People gathered around time-share computers
  - Culture promoted free exchange of software

- **Homebrew Computer Club**
  - Meeting place for hobbyists
  - Steve Wozniak created system that became Apple I

[M. J. Quinn]
Apple I Personal Computer
Personal Computer

• Altair 8800
  - Gates and Allen created BASIC interpreter
  - Interpreter pirated at Homebrew Computer Club meeting

• Personal computers became popular
  - Apple Computer: Apple II
  - Tandy Corporation: TRS 80

• Businesses drawn to personal computers
  - Computer spreadsheet program: VisiCalc
  - IBM launches IBM PC
Recent Technological Advances

- Smartphones
- Digital photography
- Automobile navigation systems
- Video streaming
Technology and Values

• Dynamic between people, technology
  - People invent, adopt technology
  - Technology changes society

• Using technology can change people
  - Experiences cause physical changes in brains (e.g., London taxi drivers)
  - Experiences with technology can have psychological effects, too (e.g., dependency on cell phones)

• Technologies solve problems, but may create new problems
  - Automobile
  - Refrigerator
  - Low-cost international communication

[M. J. Quinn]
Advances in Networking
Electricity and Electromagnetism

- Volta invented battery (1799)
- Oersted: electricity creates magnetic field
- Sturgeon constructed electromagnet
- Henry: communication using electromagnets (1830)
Telegraph

• Electric vs. Semaphore
• Built by Samuel Morse, 1843-1844
• Private networks flourished
  - 12,000 miles of lines in 1850
  - Transcontinental line in 1861 put Pony Express out of business
  - 200,000 miles of lines by 1877
• Technology proved versatile
  - Fire alarm boxes
  - Police call boxes

Semaphore Telegraph Tower,
[Photo l’Adresse Musée de La Poste]
[M. J. Quinn]
Impact: Pony Express Riders Lose Jobs

[© North Wind Picture Archives / Alamy]
Telephone

- Alexander Graham Bell
  - A "harmonic" telegraph
  - Leveraged concept into first telephone

Social impacts:
- Blurred public life / private life boundary
- Eroded traditional social hierarchies
- Reduced privacy: party lines
- Enabled first “online” communities
Typewriter and Teletype

• Typewriter
  - Individual production of “type set” documents
  - Common in offices by 1890s

• Teletype
  - Typewriter connected to telegraph line
  - Popular uses
    • Transmitting news stories
    • Sending records of stock transactions
Radio

• Pioneers
  - Hertz generated electromagnetic waves
  - Marconi invented radio
• First used in business
  - Wireless telegraph
  - Transmit voices
• Entertainment uses
  - Suggested by Sarnoff
  - Important entertainment medium by 1930s
Television

• Became popular in 1950s
  - Price fell dramatically
  - Number of stations increased

• Social effects
  - Worldwide audiences
  - Networks strive to be first to deliver news
  - Impact of incorrect information; e.g., 2000 presidential election
Remote Computing

• Stibitz and Williams built Complex Number Calculator at Bell Labs
• Bell Labs part of AT&T (phone company)
• Teletype chosen for input/output
• Allowed operator to be distant from machine
• Long-distance demonstration between New Hampshire and New York City
ARPANET

- DoD created ARPA in late 1950s
- Licklider conceived of “Galactic Network”
- Decentralized design to improve survivability
- Packet-switching replaced circuit switching
Circuit-switched v. Packet-switched Networks

(a)

(b)
Email

• Creation
  - Tomlinson at BBN wrote software to send, receive email messages
  - Roberts created email utility

• Current status
  - One of world’s most important communication technologies
  - Billions of messages sent in U.S. every day
Internet

• Kahn conceived of open architecture networking
• Cerf and Kahn designed TCP/IP protocol
• Internet: network of networks communicating using TCP/IP
NSFNET

• Created by National Science Foundation
• Provided access grants to universities
• Encouraged commercial subscribers for regional networks
• Banned commercial traffic on NSFNET Backbone
• Private companies developed long-distance Internet connections
• After private networks established, NSF shut down NSFNET Backbone
Broadband

- High-speed Internet connection
- Makes feasible transfer of very large files (e.g., video)
- Growth in file-swapping growth parallels growth in broadband

Typical broadband speeds
- South Korea (#1): 14.0 megabits/second
- Japan (#2): 10.8 megabits/second
- United States (#8): 7.4 megabits/second
Wireless Networks

- Cell phones
  - Appeared in 1973, weighed 2 ½ pounds
  - Now weigh a few ounces and also support texting and broadband Internet access
- Public access wireless local area networks
  - Proposed in 1993
  - Hotspot: wireless Internet access point
  - Wi-Fi most common hotspot technology
Advances in Information Storage and Retrieval
Greek Alphabet

- True alphabet: letters for both consonant and vowel sounds
- 750 BC: Greeks developed first true alphabet with 24 characters
- Simple, efficient way of transforming spoken words into written form
- Oral culture transitioned to written culture
Codex and Paper

• Codex
  - Rectangular pages sewn together on one side
  - Replaced papyrus scrolls as way of storing books
  - Allowed quicker access to particular passages
  - First produced by hand, then by wood engraving

• Paper
  - Invented by Chinese, brought to Europe in late Middle Ages
  - By 15th century replaced parchment for pages in less expensive codices
Gutenberg’s Printing Press

- Based on movable metal type
- Church principal customer of early publishers
- Powerful mass communication tool
- Printing press’s impact on Reformation
  - More than 300,000 copies of Luther’s publications
  - Protestants out-published Catholics by 10-to-1 in the middle 16th century
Newspapers

- Newspapers: Stimulated free expression
- Governments responded
  - Licensing
  - Censorship
- Impact on American Revolution
  - Newspapers helped unify colonies
  - Swayed public opinion toward independence
Hypertext

• Vannevar Bush envisioned Memex

• Ted Nelson
  - Coined word hypertext
  - Proposed creation of Xanadu

• Douglas Engelbart
  - Directed construction of NLS (oNLine System)
  - Demonstrated windows, email, mouse, videoconferencing
Englebart's "Mother of all Demos"
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Homework

- Writing Assignment 1: Is Google Making Us Stupid? N. Carr
- Read Chapter 2