Lecture 2

History of Computing
Let’s see if we can get our clickers working!

• First, I think we need to change the frequency
  – press and hold “on/off” for 2 seconds until power light flashes
  – enter “A” then “B”
  – you should get a green light indicating that it worked
  – if not, or if you make a mistake, just repeat
  – unfortunately, I think you’ll need to do this every class

• You’ll need to register your clicker on WebCT
  – if you haven’t done it by now, you’ve missed out on the 5% participation marks we awarded for registering on time
  – you still need to do it to get credit for all your clicking

• Now let’s do a sample poll
Today’s lecture

• Discussion questions from last class
• Introduction
• Milestones in computing
• Milestones in networking

...then, if we make it this far:

• Milestones in information storage and retrieval
• Information technology issues
1.1 Discussion Questions
“For the protection of children, computers in libraries should be configured to block objectionable content.”

A: You Agree
B: You Disagree
Intellectual Property

“The producers of software should have the right to prevent others from copying the software they produce.”

A: You Agree
B: You Disagree
Privacy

“The Vancouver Police should use Facebook posts to prosecute alleged participants in the 2011 Stanley Cup riot.”

A: You Agree
B: You Disagree
“Canadians should have the right to vote online in federal, provincial and municipal elections.”

A: You Agree
B: You Disagree
“The manufacturer of a self-driving car should not be held responsible for crashes in bad weather, such as snow storms.”

A: You Agree
B: You Disagree
“A UBC CS sysadmin accidentally discovers pornography in a student’s private department file space, depicting a woman the sysadmin believes may be under 18. The sysadmin should inform the department head.”

A: You Agree
B: You Disagree
“It is immoral for a corporation to pay its CEO 400 times as much as a production worker.”

A: You Agree
B: You Disagree
1.1 Introduction
Information Age

- Era characterized by unprecedented access to information
- Catalysts
  - Low-cost computers
  - High-speed communication networks
Some Important Advances in Past Two Decades

What technologies do you think have been pivotal, and why?

Some key technologies:
• Cell phones
• MP3 players
• Digital photography
• Email
• World Wide Web
• Social networking
1.2 Milestones in Computing
Aids to Manual Calculating

- Tablet
  - Clay, wax tablets (ancient times)
  - Erasable 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)
Early Mechanical Calculators

• Calculators of Pascal and Leibniz (17\textsuperscript{th} century)
  – Worked with whole numbers
  – Unreliable

• Arithmometer of de Colmar (19\textsuperscript{th} century)
  – Took advantage of advances in machine tools
  – Adopted by insurance companies

• Printing calculator of Scheutzes (19\textsuperscript{th} century)
  – Used method of differences pioneered by Babbage
  – Adopted by Dudley Observatory in New York
  – Completed astronomical calculations
Social Change Created Market for Calculators

• Gilded Age (late 19th century America)
  – Rapid industrialization
  – Economic expansion
  – Concentration of corporate power

• New, larger corporations
  – Multiple layers of management
  – Multiple locations
  – Needed up-to-date, comprehensive, reliable, and affordable information
Calculator Adoptions Created Social Change

• Fierce market
  – Continuous improvements in size, speed, ease of use
  – Sales increased rapidly

• “Deskilling” and feminization of bookkeeping
  – People of average ability quite productive
  – Calculators 6× faster than adding by hand
  – Women replaced men, wages dropped
Cash Register

• Store owners of late 1800s faced problems
  – Keeping accurate sales records for department stores
  – Preventing embezzlement from clerks

• Response to problems: cash register
  – Created printed, itemized receipts
  – Maintained printed log of transactions
  – Rang bell every time drawer was opened

Image courtesy of the NCR Archive at Dayton History
Punched Card Tabulation

• Punched cards (late 19th century)
  – One record per card
  – Cards could be sorted into groups, allowing computation of subtotals by categories

• Early adopters
  – U.S. Bureau of the Census (shown in image)
  – Railroads
  – Retail organizations
  – Heavy industries
Tabulators Led to Data-processing Systems

• Data-processing system
  – Receives input data
  – Performs one or more calculations
  – Produces output data

• Punched cards
  – Stored input data and intermediate results
  – Stored output
  – Stored programs on most complicated systems
Precursors of Commercial Computers

- Atanasoff-Berry Computer: vacuum tubes
- ENIAC: externally programmed with wires (shown below)
- EDVAC: program stored in memory
- Small-Scale Experimental Machine: CRT memory
First Commercial Computers

• Remington-Rand
  – Completed UNIVAC in 1951
  – Delivered to U.S. Census Bureau
  – Predicted winner of 1952 election

• IBM
  – Larger base of customers
  – Far superior sales and marketing organization
  – Greater investment in research and development
  – Dominated mainframe market by mid-1960s

Image courtesy of Unisys Corporation
Programming Languages

• Assembly language
  – Symbolic representations of machine instructions
  – However, one assembly instruction for every machine language instruction: language not simpler

• FORTRAN
  – First higher-level language (shorter programs)
  – Designed for scientific applications

• COBOL
  – U.S. Department of Defense standard
  – Designed for business applications
Time-Sharing Systems and BASIC

Two changes that led to wider adoption of computers:

• Time-Sharing Systems
  – Divide computer time among multiple users
  – Users connect to computer via terminals
  – Cost of ownership spread among more people
  – Gave many more people access to computers

• BASIC
  – Developed at Dartmouth College
  – Simple, easy-to-learn programming language
  – Popular language for teaching programming
Transistor

- Replacement for vacuum tube
- Invented at Bell Labs (1947)
- Semiconductor
  - Faster
  - Cheaper
  - More reliable
  - More energy-efficient
Integrated Circuit

• Semiconductor containing transistors, capacitors, resistors
• Invented at Fairchild Semiconductor, Texas Instruments

• Advantages over parts they replaced
  – Smaller, faster
  – More reliable, less expensive
IBM System/360

• Before System/360
  – IBM dominated mainframe marked in 1960s
  – IBM computers were incompatible
  – Switch computers → rewrite programs

• System/360
  – Series of 19 computers, varying levels of power
  – All computers could run same programs
  – Upgrade without rewriting programs
Microprocessor

• Computer inside a single semiconductor chip
• Invented in 1970 at Intel

• Made personal computers practical