Computers and the Web
a 60-year perspective

Prof. Levy
Fromm Institute
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Agenda for the course

- History and Technology
  - History, roughly by decades from 1945 to 2005
  - Technology – key inventions of each decade
History (1945 to 1980)

• 1. 1945-1955: from Manhattan Project to IBM
• 2. 1955-1965: IBM & the 7 Dwarfs
• 3. 1965-1972: minicomputers & timesharing
• 4. 1972-1980: workstations & servers
History (1980 to 2005 and beyond)

• 5. 1980-1985: personal computers
• 7. 1995-2005: the iPhone & the rise of the social media giants
• 8. 2005-2020: computing today
Technology (key inventions)

1. Digital vs. analog; binary numbers; logic circuits & arithmetic;
   • coding the operations; sequencing the operations;
   • vonNeumann: storage; numbers and operations codes

2. Core memory; magnetic storage: tape, drum & disk;
   • instruction set compatibility (IBM System/360); microcode
Technology (key inventions)

• 3. Standard logic boards: DEC (PDP);
  • lower-cost computers for lab, communications, educational
  • telephone acoustic couplers/modems; printers; graphic screens;
  • multi-programming/multi-tasking operating systems; MULTICS

• 4. Semiconductor memory (RAM); Cache memory;
  • Single-user workstations; networking of computers;
  • Databases; large-scale commercial applications; UNIX
Technology (key inventions)

• 5. Hobbyists & personal computers;
  • standardized interfaces to mouse, keyboard, printer, hard disk,
  • simple programming languages (BASIC)
  • high-leverage applications: Visi-Calc, PageMaker

• 6. Internet & email; packetized networks; PDAs;
  • specialized processors for graphics;
  • multiprocessor systems; distributed computing
Technology (key inventions)

• 7. Digitized voice & music & video;
  • browsers, search engines (Google); flash memory;
  • 3G phone networks;
  • social networks (Facebook, Twitter, LinkedIn, ...)

Technology (key inventions)

8. Artificial Intelligence & robots;
   - DARPA grand challenge (self-driving vehicles);
   - language translation; vision systems;
   - game-playing (chess & Go); $35 computer systems;
   - embedded computers everywhere;
   - voice-activated “smart” speakers; Siri, Cortana & Hey Google;
   - malware & computer-based attacks;
   - prospects for the future
Computers and the Web – a 60-year perspective (C60)
C60 – Lecture 1

• History
  • 1945-1955: from Manhattan Project to IBM
C60 – Lecture 1

• Manhattan Project
ENIAC
C60 – Lecture 1

• IBM
IBM 650

1953
IBM 701 1953
C60 – Lecture 1

• other vendors of computers:
  • Sperry Rand
  • Ferranti (UK)
  • NCR
  • Raytheon
  • RCA
  • Texas Instruments

• Fujitsu (Japan)
• NEC (Japan)
• Nixdorf /Siemens (Germany)
UNIVAC
1951
C60 – Lecture 1 – Technology

• Digital vs. analog;
  • Analog computers – primarily useful for process control & servo systems

• Mathematical logic (TRUE, FALSE, AND, OR, NOT) –
  • inherently digital; performing logic in electronic circuits

• Number systems;
  • binary numbers; how to represent a number in a fixed number of digits;
Technology

• Arithmetic — adding & subtracting;
  • operations of an arithmetic & logic unit (ALU)

• Where to store numbers? — memory & addressing

• Where to store instructions? (cards, plug-boards → memory)
  • coding & sequencing the operations; fetch, execute, increment
Technology

- general registers
  - vs. memory fetch: LOAD & STORE operations

- index registers –
  - adding to the memory address

- vonNeumann:
  - numbers and instructions in the same memory
Technology

• Troubles in computing
  • *Storing in the wrong place!*
  • *Doing arithmetic on instructions!*
  • *Executing an instruction that isn’t there!*
  • *Getting started –*
    • initializing the computer,
    • initializing the memory (instructions & data values)