Computer History

CSCI 101
References

• Slides are heavily based on, and contain content from:
  Technology in Action Eleventh Edition by Evans, Martin, and Poatsy
Computer History

• In 40 years computers went from being giant expensive machines that only corporations could own to the personal computer we see today.
Early Calculating Devices

• People have been using devices to aid in calculation for thousands of years.

• Devices include
  – fingers
  – tally sticks (animal bones carved with notches)
  – counting rods (I, II, III, IIII, IIIII, T)
  – the abacus, ...
Abacus

- A counting device
- Beads are moved to perform arithmetic functions
- Still used by traders and clerks in Asia, Africa, ...
- Demonstration: https://www.youtube.com/watch?v=FTVXUG_PngE

2700-2300BC
Slide Ruler

- An early analogue computer used primarily for multiplication and division.
- Invented by William Oughtred
- Slide rulers were taken to the moon in the 1960s
  http://www.youtube.com/watch?v=HD0NfshRyh8
- Demonstration:
  - https://www.youtube.com/watch?v=waiprjueVpQ
Pascaline

- Blaise Pascal created the first mechanical calculator
- Performed addition and subtraction
- Was too expensive for the time, hence it didn’t become a commercial device.
Tables

• Mathematical tables were created by people called ‘computers’.
• They were large charts showing the results of calculations, e.g. multiplication, division, and trigonometry
• However, these were known to be error prone,
• Thus the need for more accurate math drove innovation.
Charles Babbage

• Noticed errors in mathematical tables (1820)
• Created the difference engine to compute this math more accurately
• Used tons of grant money as well as his own
• Only built a small part, as he also had to construct the tools to build it
• Rather than finishing he went on to design the Analytical engine.
Charles Babbage & Organs

• Charles Babbage did not like the street organ players. He felt they disturbed people from their work
• He would chase them around town, complain to authorities about their noisy presence, and forever ask the police to arrest them (Wikipedia)
• When on his death bed the organ grinders played outside his house to upset him.
Difference Engine

• The first mechanical computer
• Created by Charles Babbage, a “father of computing”
• Compiled mathematical tables
  – add, subtract, polynomial functions

1821
Analytical Engine

- Designed by Charles Babbage, a successor to the Difference Engine
- Added logic, such as control flow and loops
- Used punch cards to hold instructions
- This machine was never built
What are Punch Cards?

• Stiff paper that holds commands
• Commands and data are indicated by holes/no holes
• Early computers used these as input commands
Ada Lovelace

• Suggested that Charles Babbage used Binary in his Analytical Engine
• She wrote the first algorithm that would have been executed by the machine
• She is the world's first programmer
Herman Hollerith

- During the Industrial revolution the population 30% each decade.
- They were still tabulating census data by hand.
- In 1887 they still had not completed tallying the 1880 census data.
- Herman Hollerith an MIT prof introduced punch cards and a machine to read them to tally this information.
- Took only 6 weeks to tally the 1890 census.
- He continued to improve the machine, and created the company IBM.
1st Generation Computers

- Based on Vacuum tubes
- 1946 – 1958
- Examples
  - Atanasoff-Berry Computer
  - Colossus
  - Harvard mark 1
  - ENIAC
  - EDVAC
  - UNIVAC
Vacuum Tubes

- Control electric current using the vacuum
- Can be used to start/stop, or change the flow based on the current
Atanasoff-Berry Computer 1930

- First Automatic Electronic Digital Computer
- Created by Vincent Atanasoff and Clifford Berry
- Solved linear equations
- Used binary arithmetic and electronic switching
- Vacuum tubes store data
Colossus

- First electronic digital computer that was programmable
- Created by British Code Breakers during WW II to help read encrypted messages
- Processed 25,000 characters per second
Harvard Mark 1

• A electro-mechanical computer
• Created by Howard Aiken and Grace Hopper
• Developed and built by IBM
• Could store 72 numbers
• Multiplication took 6 seconds
• Used in WW II to compute artillery tables

1944
First Computer Bug

• Grace Hopper found the first computer bug while working on the Harvard Mark II
• A moth was trapped between two relay switches
• She took a photo to document it

1947
ENIAC

- First electronic general purpose computer
- Created at the University of Pennsylvania
- Cost almost $500,000 (approx. $6,000,000 today)
- One of first programs a study of the hydrogen bomb
- Designed to determine where to fire cannons in WW II
ENIAC

• Contained 17,468 Vacuum tubes 7,200 crystal diodes, ...
• Tubes burnt out fast, hence the machine normally could only run for 10 to 30 minutes at a time
• Speed was 1000 times of electro-mechanical machines (Wikipedia)
• 5000 adds, 357 multiplications, and 38 divisions per minute
UNIVAC

• Inventors of ENIAC made UNIVAC which is a programmable (held data and printed)
• Few people bought it as they didn’t understand the value
• Then they used it to project the 1952 presidential election, and it got the answer with <1% error
Second Generation Computers

- Based on Transistors
- 1955-1964
- Moved from Binary to Assembly
- Programmers could use COBOL and FORTRAN
- Stored instructions in memory
- Relied on punch cards for input and printers for output
Transistors

• Replaced vacuum tubes
• Invented at Bell laboratories
• Enabled computers to be smaller, cheaper, more reliable, and efficient
• Still generate a lot of heat, but less than vacuum tubes
IBM 1400

- General purpose system
- Used punch cards for input and line printer for output

1960
Third Generation Computers

• Modern computers
• 1965-1970
• Used Integrated Circuits
• Keyboards instead of punch cards
• Monitors for display
• Different applications used through operating system
Headed to the Moon

• Much of the need for smaller technology was fuelled by America’s and Russia’s race to get to the moon

• They needed a small enough computer to fit on board.
Integrated Circuits

- Small chips containing thousands of transistors
- Invented by Jack Kilby, Nobel Laureate of Physics
IBM 360

- Small and large applications
- Commercial and Scientific applications
- From 8K to 8M of memory
- Room sized
- A whole suite of computers for different needs
Fourth Generation Computers

• Microprocessor
• Development of the personal computer
• 1971 – Today
• Addition of GUI’s, the mouse, and handheld devices
Microprocessor

- Thousands of Integrated Circuits were built on a silicon chip.
- Created by Intel corp.
- Becomes the Central Processing Unit (CPU)
- Allow computers to be smaller, more powerful, faster, and cheaper
Altair 8080

- First personal computer
- Make it yourself kit
- Switches for input, lights for output
- No keyboard, and no monitor
- People were so excited, within 3 months 4000 orders were placed
- https://www.youtube.com/watch?v=ZKeiQ8e18QY
Altair 8080

• Gates and Allen were trying to meet with MITS founder who created the Altair
• They built an interpreter for the 8080 to make programming easier.
• They created a Bootstrapper to load the tape to load the program on a plane ride on final approach to their meeting
Apple I and II

- Steve Wozniak and Steve Jobs built the Apple I in Wozniak’s garage
- Apple II had a color monitor, sound, and game paddles
IBM PC

- IBM released its first personal computer
- Sold in companies such as Sears

1981
BASIC

- Beginners All-Purpose Symbolic Instruction Code
- A programming language that students could learn
- Used by Bill Gates and Paul Allen to write a program for the Altair
MS-DOS (Disc Operating System)

• IBM hired Bill gates and Paul Allen to build an Operating System for the IBM PC
• They bought the rights to an existing operating system built in Seattle
• IBM allowed Gates and Allen to keep the marketing rights to DOS
Reverse Engineering

• Companies like Compaq took apart IBM computers, and reverse engineered their BIOS to create very similar machines.
• They built a fully compatible machine, and sold it for a bit cheaper.
• In first year sold 47,000 pcs and made 111 million dollars
• Hence, the competition began
• And everyone bought Microsoft OS
Spreadsheets and Word Processing

• In 1978 VisiCalc was created for Spreadsheets and WordStar was created for Word Processing
Graphical User Interface (GUI)

• In 1972 Apple and Xerox were working on making a graphical user interface
• WYSIWIG (What you see is what you get)
• The idea being you want to be able to preview your work on the computer
Apple’s 1984 Commercial

- As Microsoft was aiming their products towards business users, apple tried to make the first user friendly PC.
- [https://www.youtube.com/watch?v=axSnW-ygU5g](https://www.youtube.com/watch?v=axSnW-ygU5g)
- This commercial was fighting out against IBM which they saw as Big Brother
Cellular Phones and Smart Phones

• Now we’re able to have a ton of processing power is such tiny devices
Wearable Computing

• Now we can track so much of what we do, and have the internet at our finger tips

• https://www.youtube.com/watch?v=JSnB06um5r4
Fifth Generation Computers

- Enhancement of Artificial Intelligence
- Nanotechnology
- Natural Language Processing
- ...

Ubiquitous Computing

• Technology is becoming a fundamental part of our lifestyles
• Always on, always connected.