

CS 145:

Computer History

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UW Math '25

NOTABLE PEOPLE

ALONZO CHURCH

Alonzo Church was an American mathematician who lived from 1903 - 1995.



He is most well-known for pioneering "lambda calculus"; a formal system of mathematical logic for expressing computation through function abstraction and application.

HASKELL CURRY

Haskell Curry was also an American mathematician who lived from 1900 - 1982.



He is most well-known for his work in "combinatory logic"; a notation which eliminates the need for quantified variables (e.g. \forall, \exists) in mathematical logic.

JOHN VON NEUMANN

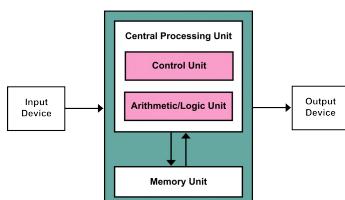
John Von Neumann was a Hungarian-American mathematician / physicist / computer scientist / engineer, who lived from 1903 - 1957.



One of his most prominent contributions to computer science is the "von Neumann model": a design architecture for an electronic digital computer.

The von Neumann model features five components:

- ① A (central) processing unit;
 - . contains an arithmetic logic unit & processor registers
- ② A control unit;
 - . contains an instruction register and program counter
 - . think "instruction pointer" in Assembly
- ③ A memory;
 - . stores data and instructions
- ④ External mass storage; and
 - . stores large amounts of data for later use
 - . eg "disk drives"
- ⑤ Input and output mechanisms;
 - . acts as the method of communication between user and computer



CLAUDE SHANNON

Claude Shannon was an American mathematician / engineer / cryptographer who lived from 1916 - 2001.



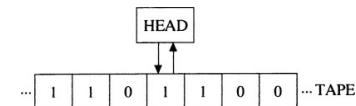
He is widely known as the father of "information theory"; the study of the quantification, storage and communication of information.

ALAN TURING

Alan Turing was an English mathematician / computer scientist / logician / cryptanalyst / philosopher / theoretical biologist who lived from 1912 - 1954.



He is widely credited with developing the "Turing machine": a mathematical model of computation that defines a machine that manipulates symbols on a strip of tape according to a table of rules.



HERMAN HOLLERITH

Herman Hollerith was an American businessman / inventor / statistician who lived from 1860 - 1929.



He is widely credited for inventing the "tabulating machine": an electrochemical machine designed to assist in summarising information stored on punched cards.

*these cards are called "Hollerith cards".

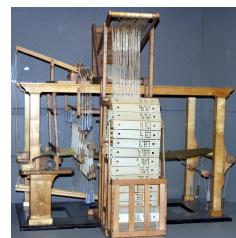


JOSEPH MARIE JACQUARD

💡 Joseph Marie Jacquard was a French weaver/merchant who lived from 1752-1834.

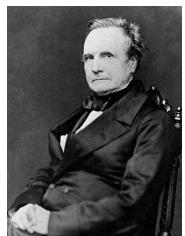


💡 He is most renowned for inventing the "Jacquard loom"; a device that can be fitted to looms to simplify and automate the manufacturing of textiles with complex patterns.

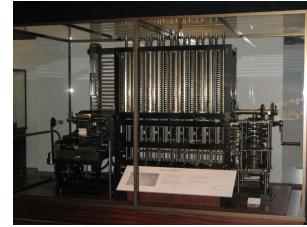


CHARLES BABBAGE

💡 Charles Babbage was an English polymath, who lived from 1791-1871.



💡 He is widely known as the "father of computing", with one of his most significant inventions being the "Difference Engine": an automatic mechanical calculator designed to tabulate polynomial functions.



ADA LOVELACE

💡 Ada Lovelace was an English mathematician/writer who lived from 1815-1852.



💡 She is most well-known for her work on Babbage's "Analytical Engine": a proposed mechanical general-purpose computer which incorporated

- ① an arithmetic logic unit;
- ② a control flow; and
- ③ an integrated memory.

AT&T BELL LABS (NOKIA BELL LABS)

💡 "AT&T Bell Labs" (now called "Nokia Bell Labs") is an American industrial R&D company which is now owned by the Finnish company Nokia.



💡 The company made many major contributions to the field of telecommunications, especially during the 1980-1990s.

NOTABLE THINGS

FLIP FLOP

💡 A "flip-flop" (or "latch") is an electronic circuit that has two stable states and can be used to store information.

💡 We usually denote the "on" state as "1", and the "off" state as "0".

DYNAMIC VS. STATIC RAM

💡 First, note that RAM (aka "random access memory") is a form of computer memory that can be read and changed in any order, usually used to store data and machine code.

💡 In dynamic RAMs (aka "DRAMs"), data is stored as bits in memory cells consisting of a tiny capacitor and a transistor.

💡 In static RAMs (aka "SRAMs"), memory is stored as bits via latching circuitry (ie flip flops).

💡 Similarity: both forms of RAM are "volatile"; ie they lose data quickly if power is lost.

💡 Difference: DRAM needs to periodically be "refreshed" (ie rewriting the information to preserve it), whilst this is not necessary for SRAMs.

MAGNETIC CORE MEMORY

💡 Magnetic-core memory is a type of RAM which uses transformer cores (made out of a magnetic material) to store bits of information.

💡 The value of the corresponding bit of information a core has is dependent on the direction of the core's magnetisation (either clockwise or counter-clockwise.)

CRT MEMORY (WILLIAMS TUBE)

💡 A "Williams tube" is an early form of computer memory, which used CRTs (aka cathode ray tubes) to function.

💡 Note that Williams tubes were dynamic RAMs.

DELAY LINE MEMORY

💡 "Delay line memory" was also an early form of memory, invented around the end of WWII.

TELEPHONE EXCHANGE / SWITCH

💡 A "telephone exchange/switch" is a telecommunications system which interconnects subscriber lines or virtual circuits of digital systems to establish telephone calls between subscribers.

💡 These are primarily used in the "public switched telephone network" (aka PSTN) or in large enterprises.

REGISTER MACHINE

💡 A "register machine" is a generic class of abstract machines used in a manner similar to a Turing machine.

💡 Each machine in this class must be "Turing equivalent" to one another; ie any two given machines in this class must be able to replicate each other.

BOOLEAN ALGEBRA

💡 "Boolean algebra" is the branch of algebra in which each variable has truth values "true" and "false".

💡 The main operations in boolean algebra are:

- ① the conjunction (and), denoted by " \wedge ";
- ② the disjunction (or), denoted by " \vee "; and
- ③ the negation (not), denoted by " \neg ".

STORED-PROGRAM COMPUTER

💡 A "stored-program computer" is a computer that stores program instructions in an electronically or optically accessible memory.

CPU

💡 A "central-processing unit" (or "CPU"), is the electronic circuitry within a computer that executes instructions that make up a computer program.

💡 In particular, the CPU has two notable components:

- ① The "arithmetic/logic" unit; and
 - handles arithmetic & conditionals
- ② The "control" unit:
 - equivalent to the tail recursive "cycle" procedure in Racket

REPEATER

💡 A "repeater" is an electronic device that extends the transmission distance a signal can travel, or allow the signal to be received on the other side of an obstruction.

💡 It does this by receiving the signal and retransmitting it.