Introduction to Computer Systems

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Last lecture

- Course Information

- Discussion about Programming and Python in Research and Industries

- Why we use Python

- How to use Python

Today

- Review the Last Lecture

- History of Computation and Computers

- Component of a Computer System

- Type of Programs in Computers

- Algorithm: Programs Brain

- Application of Programming in the Digital Age!

Together

Send your feedback about the class whenever you want!

Contact me

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- Telegram: @IKJ1992

Main links for our class

- Telegram group: t.me/SharifPythonSpace1401
- GitHub organization: github.com/SharifPythonSpace

Review the Last Lecture

Grading

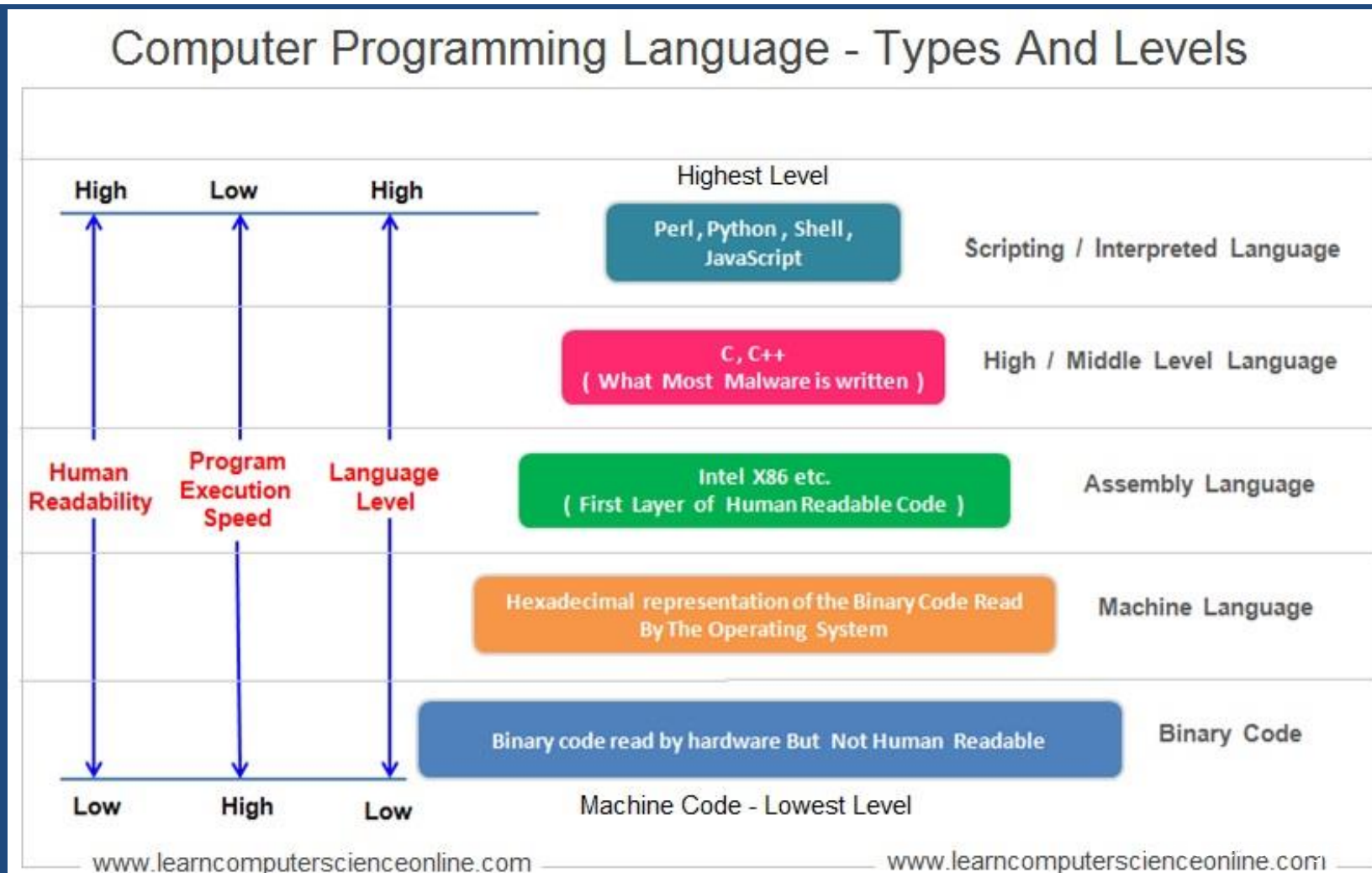- Approx. 20% Programming Assignments
- Approx. 2% Challenging Questions and Contributions in Class
- Approx. 13% Mid-term Project (alone)
- Approx. 35% Final Project (team work~5 member)
  - *Proposal (about real needs)*
  - *Coding*
  - *Release*
- Approx. 30% Final Exam
- Approx. 5% Presentation with Code(extra score)

Language!

Computer Programming Language - Types And Levels

Do you know about its applications?

History of Computation and Computers

From computing…

- The **history of computing** is longer than the history of computing hardware and modern computing technology and includes the history of methods intended for pen and paper or for chalk and slate, with or without the aid of tables.

From computing...

- Eventually, the concept of numbers became concrete and familiar enough for counting to arise, at times with sing-song mnemonics to teach sequences to others. All known human languages, except the Piraha language, have words for at least "one" and "two", and even some animals like the blackbird can distinguish a surprising number of items
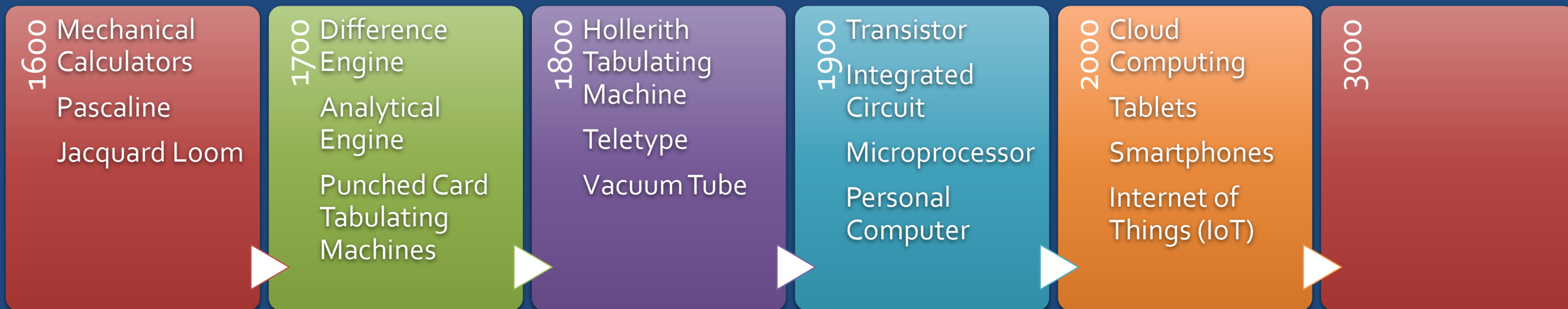
From computing…

- The first aids to computation were purely mechanical devices which required the operator to set up the initial values of an elementary arithmetic operation, then manipulate the device to obtain the result.
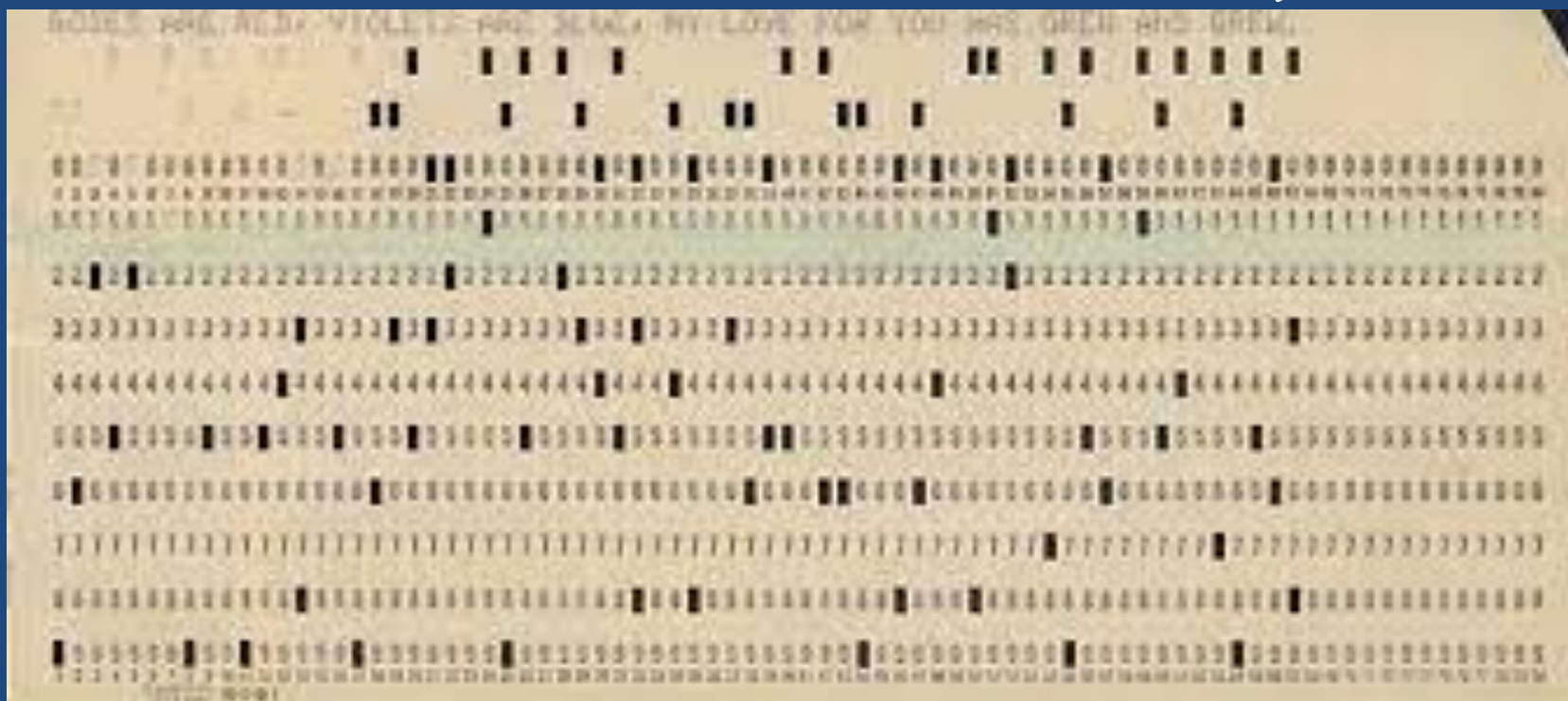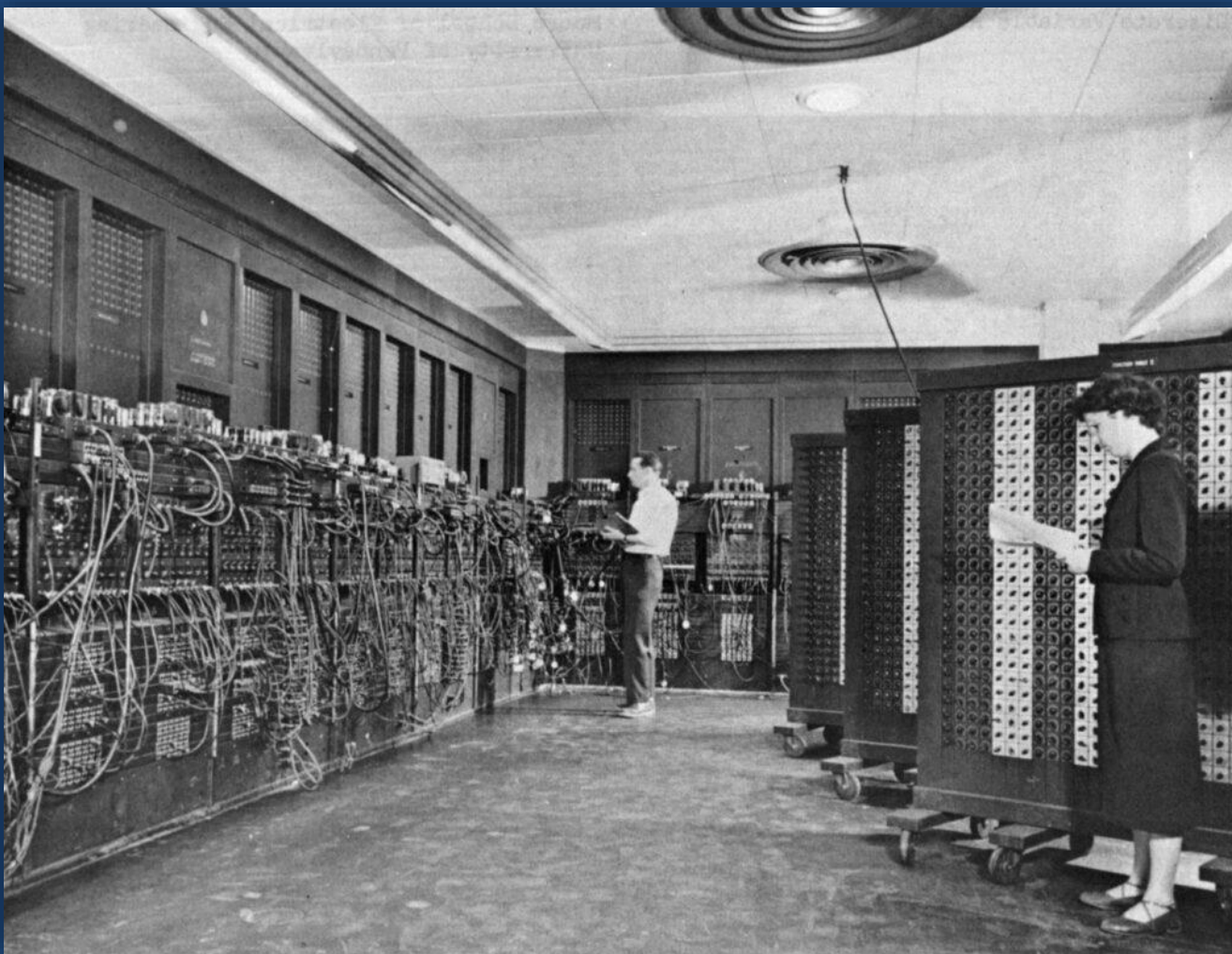
Timeline

1600	1700	1800	1900	2000	3000
Mechanical Calculators	Difference Engine	Hollerith Tabulating Machine	Transistor	Cloud Computing	
Pascaline	Analytical Engine	Teletype	Integrated Circuit	Tablets	
Jacquard Loom	Punched Card Tabulating Machines	Vacuum Tube	Microprocessor	Smartphones	
			Personal Computer	Internet of Things (IoT)	

Pascaline

Punched card

اگه بخوایم ویرایش کنیم چی؟!

Punched card machine

Vacuum tube computers

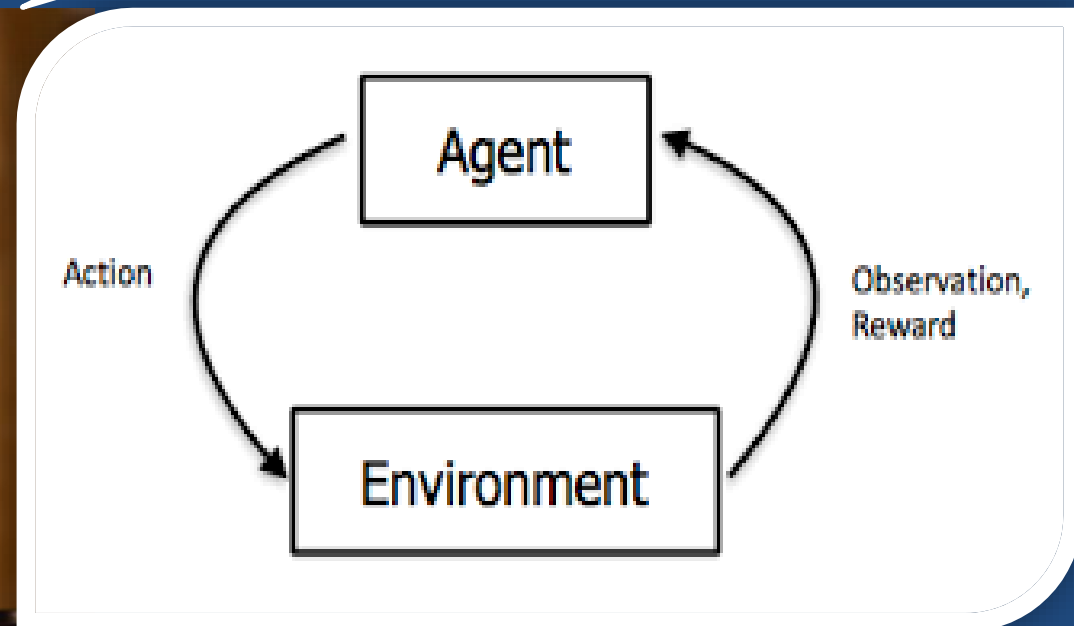17000 لامپ خلا

UNIVAC (**UNIV**ersal **A**utomatic **C**omputer)

Components of a Computer System
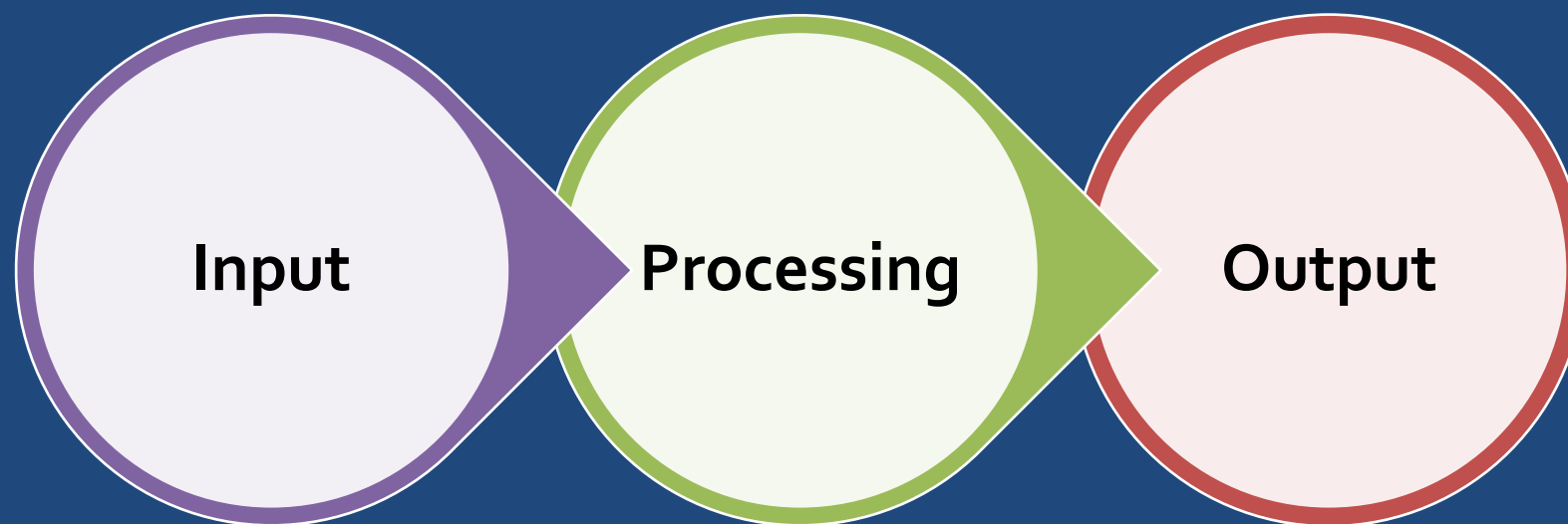
Computer is like a human!?

What is computer in general?

- A computer is a complex and modular system (in its hardware and software) for problem solving, computing, and data processing in different domains.

Input ➤ **Processing** ➤ **Output**

A computer may be a TV!

How to convert a problem to machine language?

Needs analysis

Well-defined problem definition

Write an **algorithm** in a paper or your brain!

Select a suitable programming language

Write a **program**

Run **compiler** or **interpreter**

…

What is hardware and software?

- The hardware components of a computer system are the electronic and physical parts.

- But, the software components are all things except hardware! These are data, or programs or other soft parts!
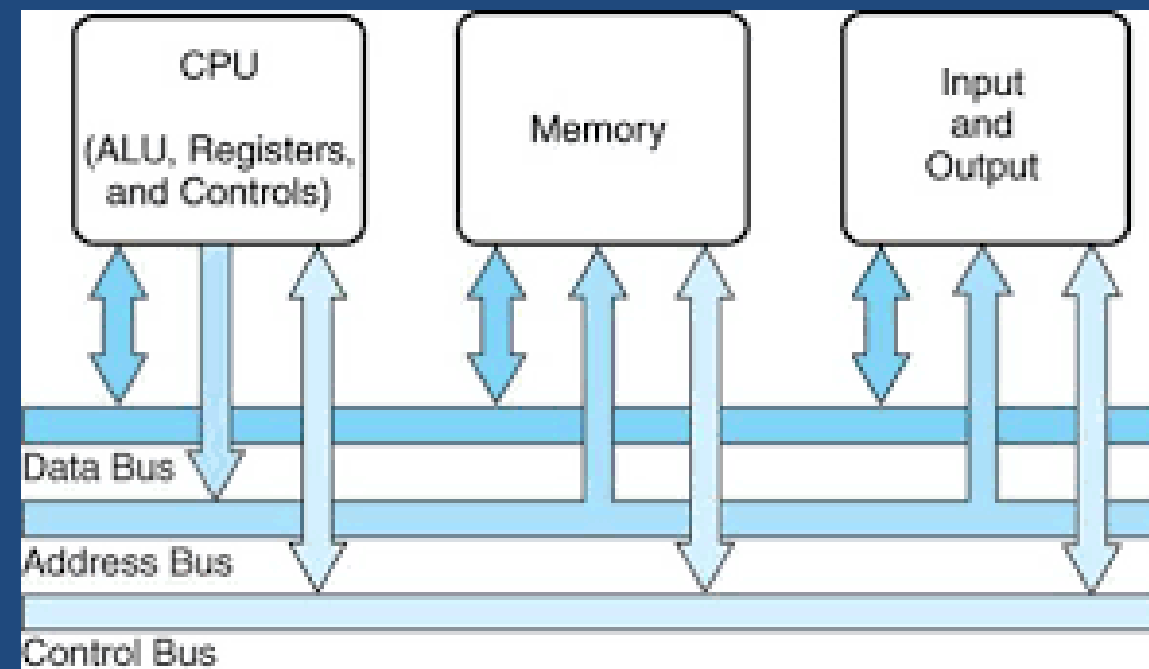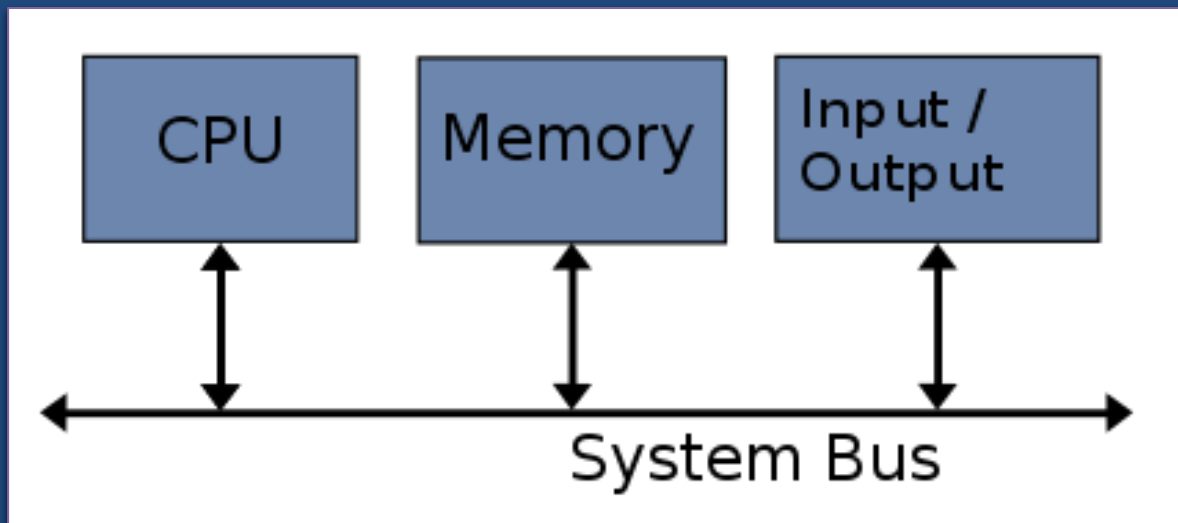
Typical hardware

- Processor (cortex and neocortex)
- Memory
  - Main
  - Secondary
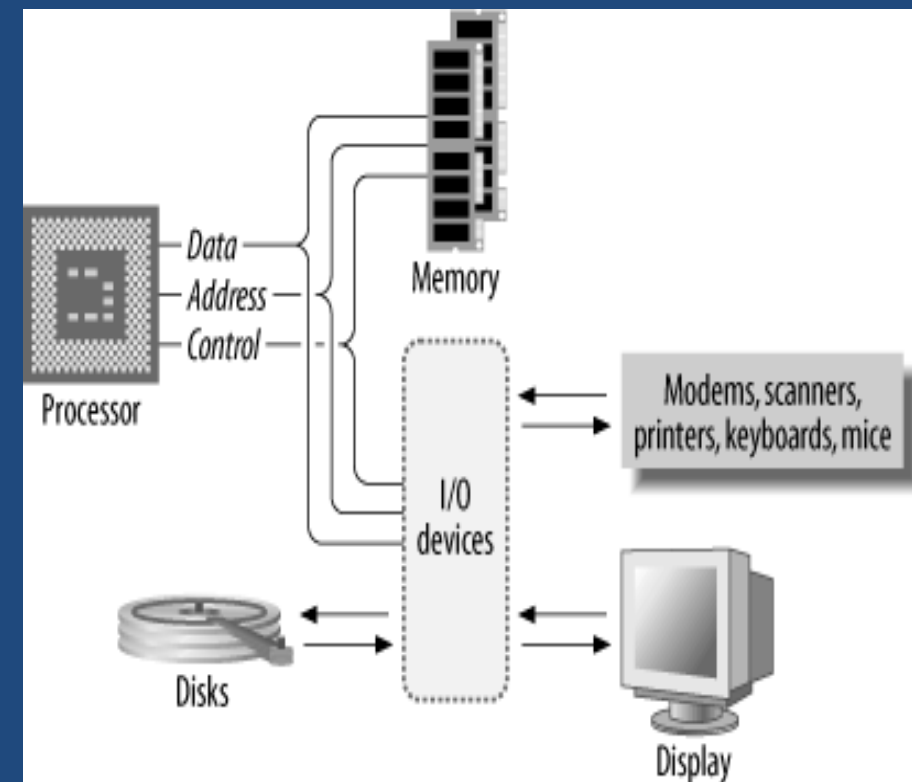- Input device (sensor)
- Output device (actuator)
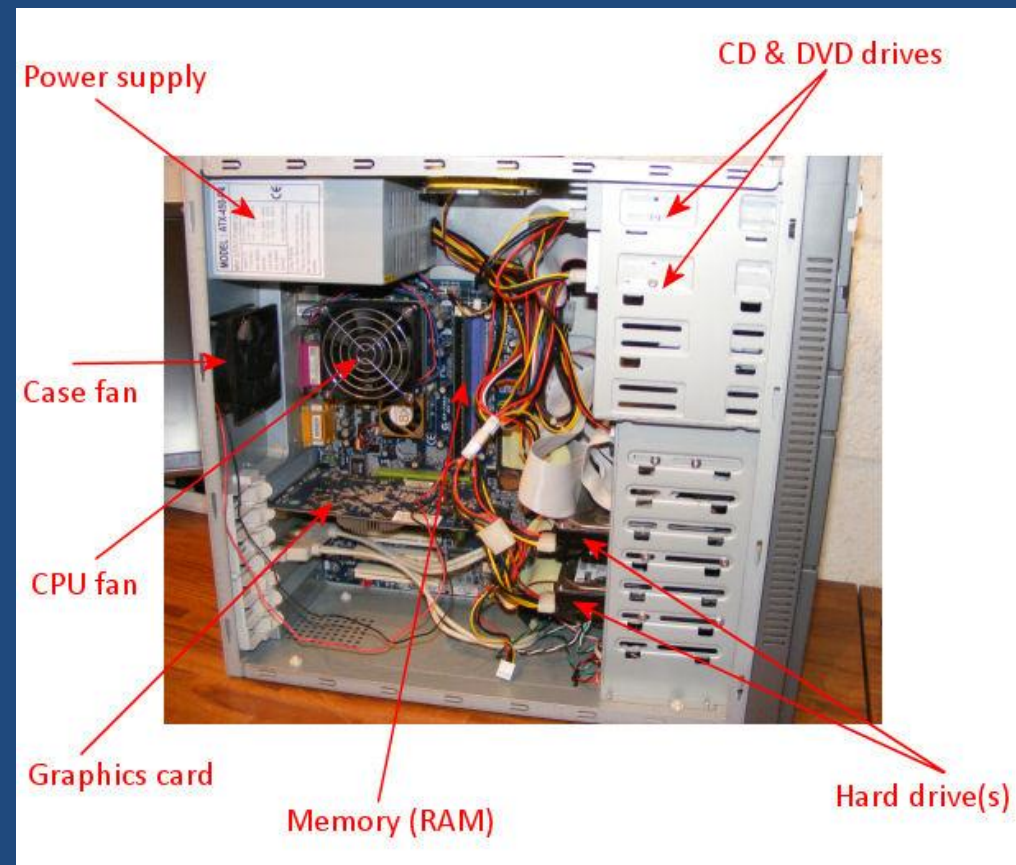
Communications!
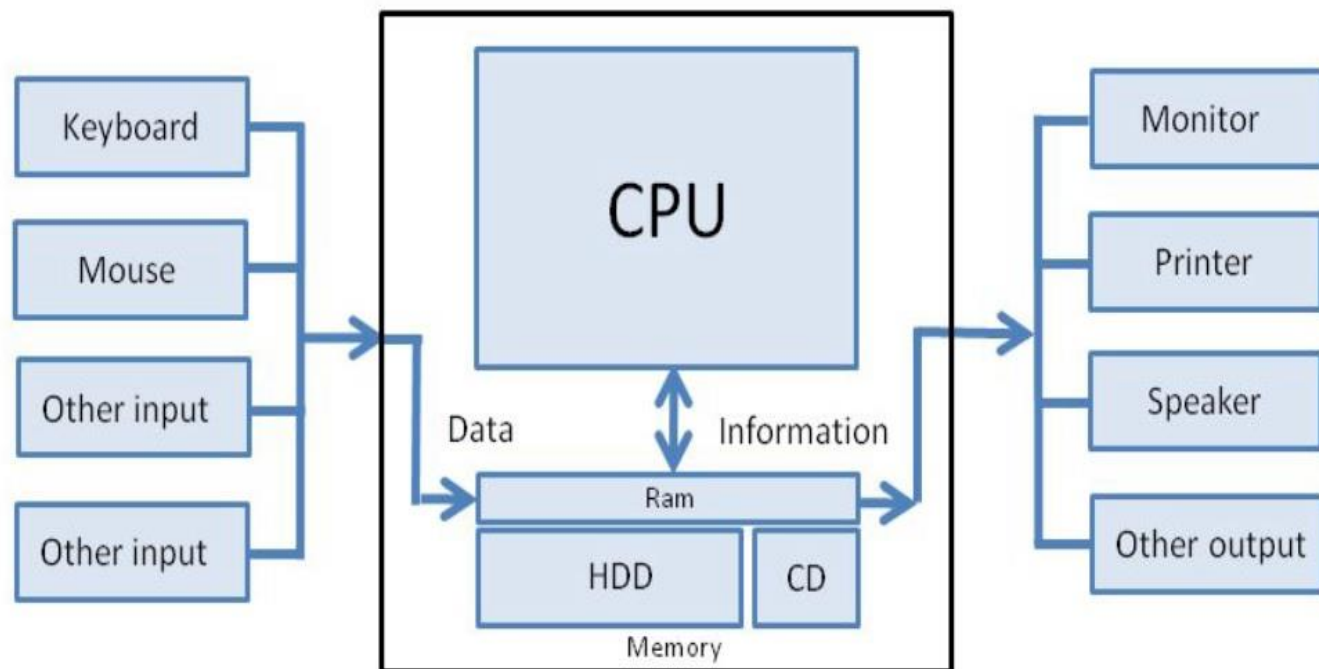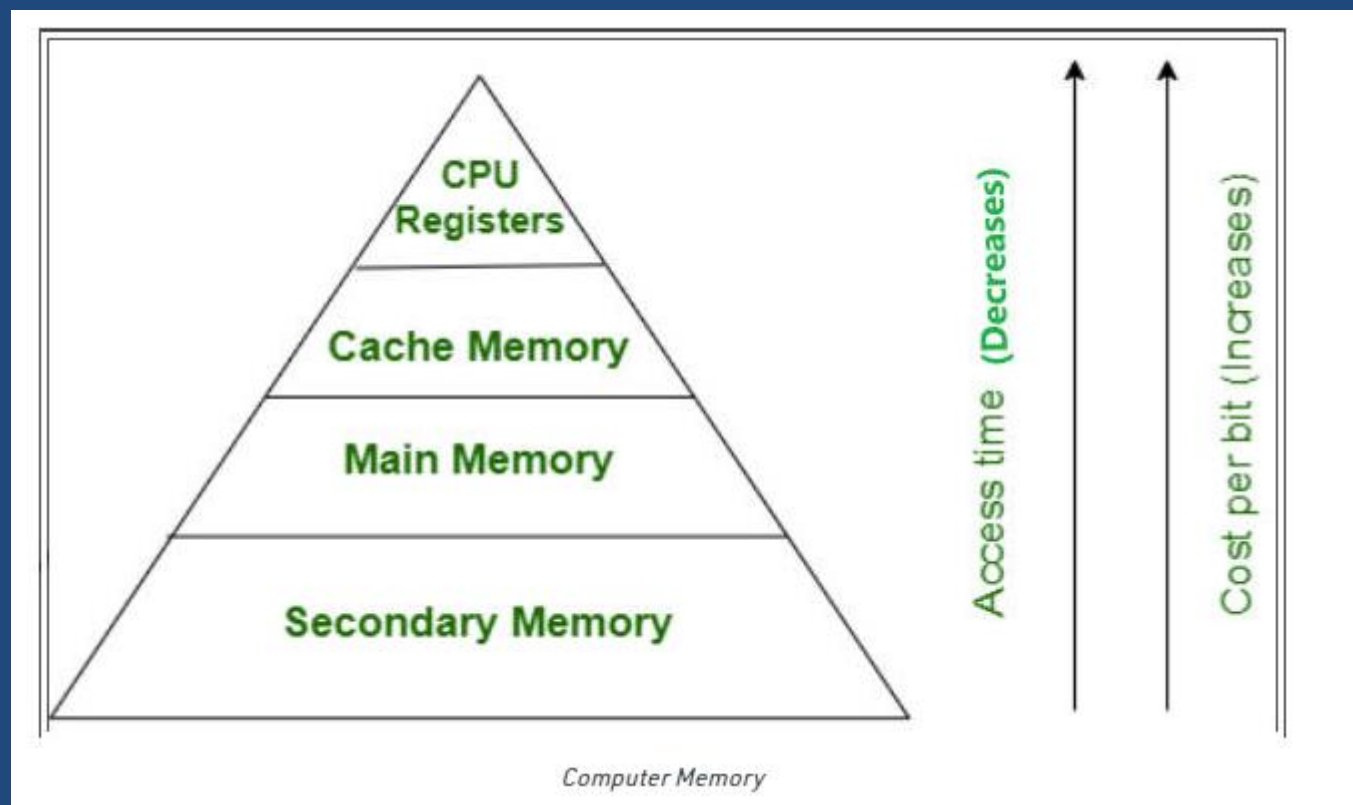
Communications!

How does computer start for doing tasks?

- ROM (Read Only Memory)

Memory hierarchy!

Computer Memory

Memory features

Primary memory	Secondary memory
Primary memory is temporary.	Secondary memory is permanent.
Primary memory is directly accessible by Processor/CPU.	Secondary memory is not directly accessible by the CPU.
Nature of Parts of Primary memory varies, RAM- volatile in nature. ROM- Non-volatile.	It's always Non-volatile in nature.
Primary memory devices are more expensive than secondary storage devices.	Secondary memory devices are less expensive when compared to primary memory devices.
The memory devices used for primary memory are semiconductor memories.	The secondary memory devices are magnetic and optical memories.
Primary memory is also known as Main memory or Internal memory.	Secondary memory is also known as External memory or Auxiliary memory.
Examples: RAM, ROM, Cache memory, PROM, EPROM, Registers, etc.	Examples: Hard Disk, Floppy Disk, Magnetic Tapes, etc.

Type of Programs in Computer

What we can run in computer?

- Application program

- System program

What is operating system?

- An operating system (OS) is the program that, after being initially loaded into the computer by a boot program, manages all of the other application programs in a computer. The application programs make use of the operating system by making requests for services through a defined application program interface (API). In addition, users can interact directly with the operating system through a user interface, such as a command-line interface (CLI) or a graphical UI (GUI).

What is operating system?
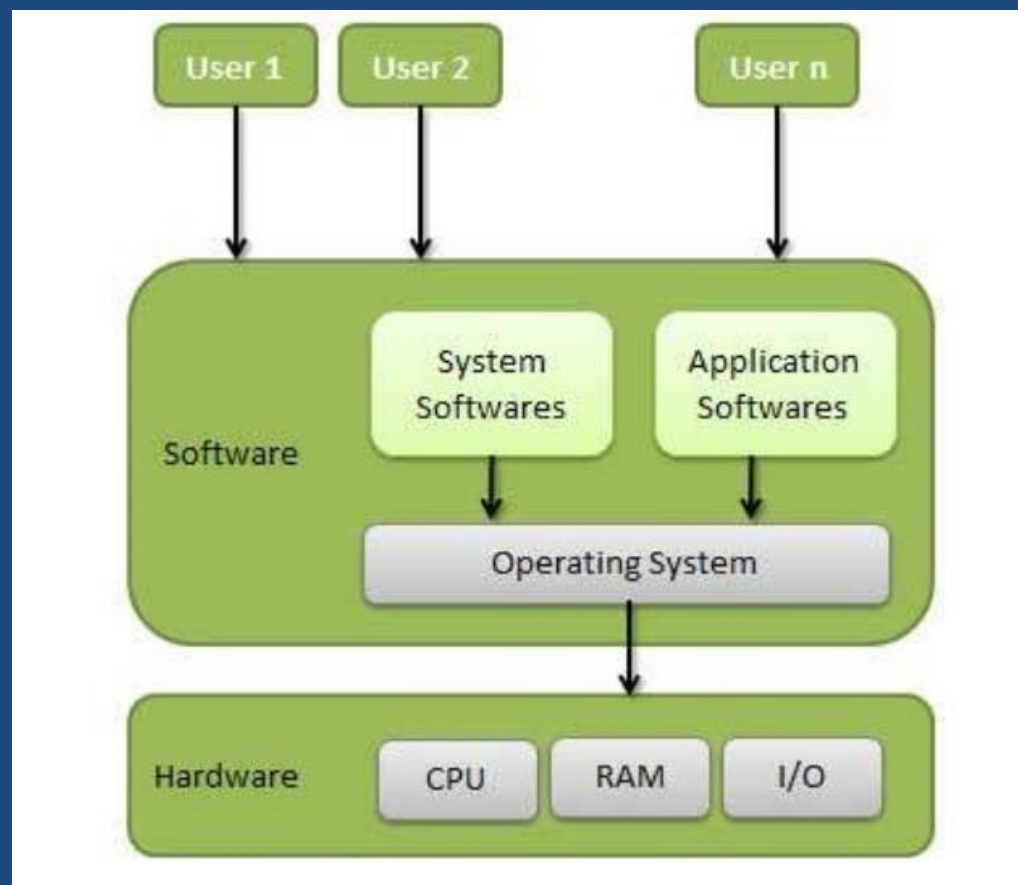
How we can use OS?

- Single OS
- Dual boot
- Virtual machine
- Docker Machine
- WSL (windows subsystem for Linux)
- ...

Starting a program is OS

- The user click or select an application program

- The OS detect its name of the program

- The OS get file of program from HDD or others

- And send it to main memory

- The OS configure resources for the program

- At last, OS is running the programming

How computers can connect to each other from a wide range or through the internet?

Who is volunteer for the short presentation?

Algorithm: Programs Brain!

From problems…

- The problem must be translated to understandable structure (programs) for computers.

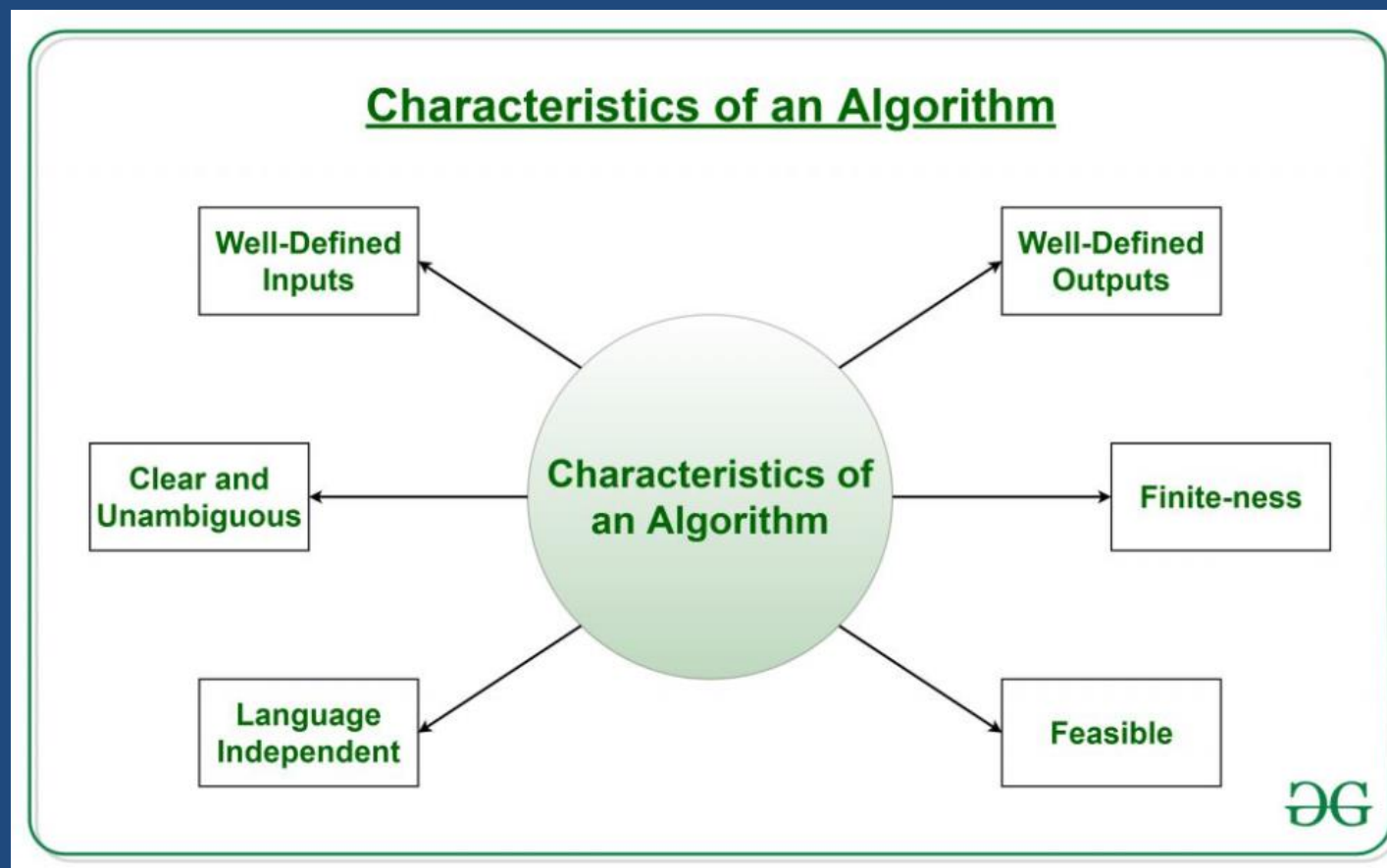- Algorithm is a step-by-step procedure for computation.

What is Algorithm?

- *A set of finite rules or instructions to be followed in calculations or other problem-solving operations.*

- *A procedure for solving a mathematical problem in a finite number of steps that frequently involves recursive operations.*

- *A list of finite well-defined (unambiguous) instructions for solving a problem like a cooking book.*

The characteristics of Algorithm!

Characteristics of an Algorithm

Well-Defined Inputs

Well-Defined Outputs

Clear and Unambiguous

Characteristics of an Algorithm

Finite-ness

Language Independent

Feasible

What is flowchart? What is better than a flowchart?

Who is volunteer for the short presentation?

Application of Programming in the Digital Age!

Cancer detection!

CANCER CENTER.AI

Home   Products ˅   Company ˅   Info & Knowledge Base ˅   Blog   Contact   Donate

FASTER CANCER DETECTION WITH ARTIFICIAL INTELLIGENCE

Web-based platform for professionals and patients

How to speed-up the cancer diagnosis process with AI?

In pathology

for professionals

Zoom, view, annotate and share pathology images by web/browser. Apply AI algorithms that can be manually corrected. Use built-in global standards (ICCR, WHO, ICD-O codes).

Test module for pathologists »

In radiology

for professionals

Analyze radiology images (MRI, CT, USG, and others DICOM format) imported from any device. Use AI algorithms to fasten radiological analysis and correct results manually.

Test module for radiologists »

Image digitization

for professionals

Digitize laboratory slides by using only personal microscope equipment and a camera. Store results securely in the platform.

Test PathoCam »

Medical Second Opinion & Collaboration

for patients and professionals

Share medical documents and files uploaded by radiologists and pathologists. Compare the analysis issued by different specialists. Add anonymized patient data and store them securely.

How to get second opinion »

AI algorithms available from platform interface

for professionals

Use currently available algorithms (Gleason score, Metastasis, ki67) or ask us to add your favorite one. We aim to create a perfect base of newest technologies for cancer detection in one place.

Available algorithms »

Lecture Resources

- *P. Wentworth, J. Elkner, A. B. Downey, C. Meyers. How to Think Like a Computer Scientist: Learning with Python. 3rd Edition, Open Book Project, 2011.*
- *https://en.wikipedia.org/wiki/History_of_computing*
- *https://en.wikipedia.org/wiki/History_of_computing_hardware*
- *https://www.geeksforgeeks.org/difference-between-primary-and-secondary-memory/*
- *https://www.tutorialspoint.com/operating_system/os_overview.htm*
- *https://www.geeksforgeeks.org/introduction-to-algorithms/*
- *https://cancercenter.ai/*