CAIE IGCSE ICT 0417 THEORY-REVISION

2023-syllabus

Chapter 1: **Types and Components of Computer Systems**

Chap 1: Types and Components of computer systems

Objectives:

1.1 Hardware and software,

- **Understand hardware and software (application & system software)**
- **Understand analogue and digital data,**

1.2 Main components of a computer system

- **Understand what the central processing unit (CPU) is,**
- **Understand the different internal memory (RAM and ROM),**
- **Brief introduction of input and output devices,**
- **Understand what is backing storage is.**

1.3 Operating systems

Understand user interfaces (Command line Interface, Graphical user interface, etc.)

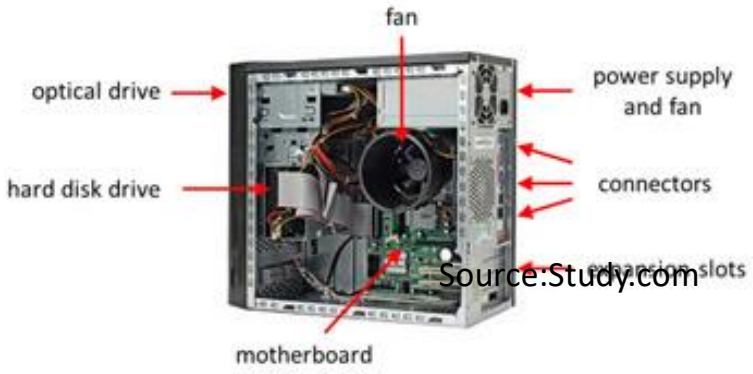
1.4 The different types of computers: desktops, laptops, tablets etc

1.5 What are emerging technologies and some examples – artificial intelligence (AI) and virtual reality (VR)

Chap 1: Types and Components of computer systems
1.1: Hardware and software

What is hardware (computer hardware)?

- "All Physical components or parts of a computer we can see and touch"
- These parts are what make up a computer
- Hardware can be Internal or external



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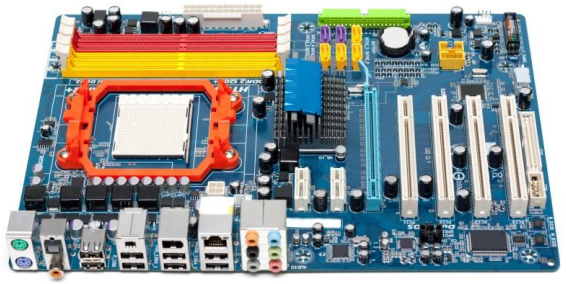
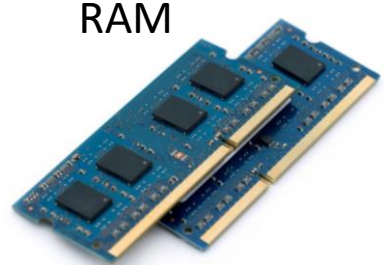

Motherboard

ROM

RAM



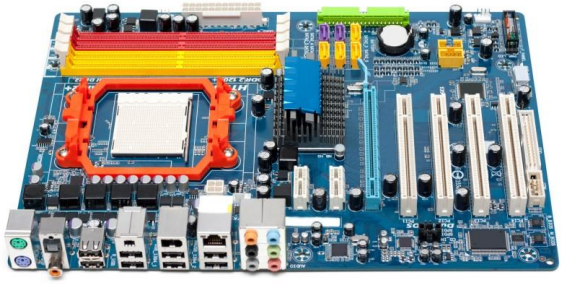
Chap 1: Types and Components of computer systems

1.1 Hardware and Software

Internal and External Hardware

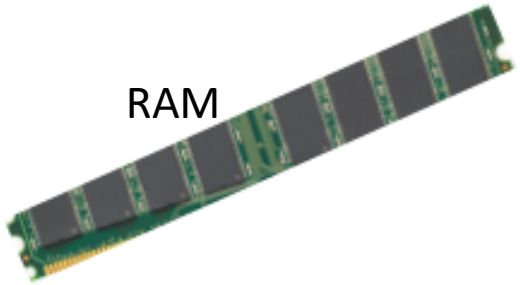
What is Internal Hardware?

- Found inside the system unit:



Motherboard

CPU



RAM

ROM

Video card

Sound card

HDD

SSD

Chap 1: Types and Components of computer systems

1.1 Hardware and software

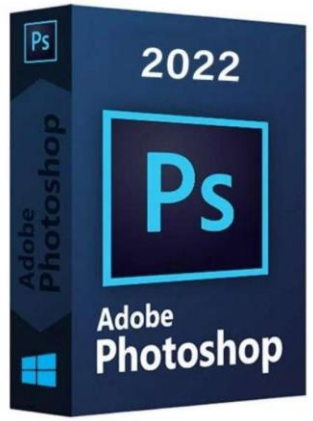
Internal and External Hardware

What is External Hardware?

- Found outside the system unit and can be input or output device:

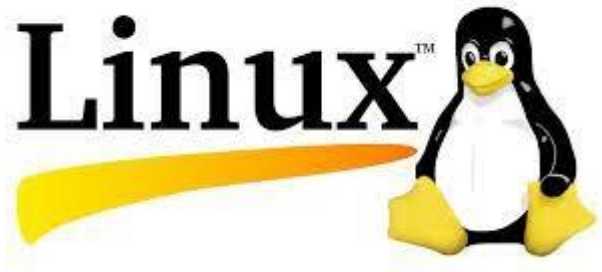
Chap 1: Types and Components of computer systems
1.1 Hardware and software.
Software and types

- What is software?
- Software is simply coded instructions (programs) that control how the computer works and process data.
- We have two types of software: Application and system software.
- Application software; Everyday programs we use to perform specific tasks on our computers. E.g MS Word, MS Excel, editing softwares (video, audio, graphics), measurements softwares, etc.



Chap 1: Types and Components of computer systems
1.1 Hardware and software.
Software and types cont..

- System software; refers to operating systems and other utilities that enable smooth functioning of a computer.
- Examples are: operating systems, device drivers, linkers, disk cleaners, virus protection, compilers etc.



Chap 1: Types and Components of computer systems

1.1 Hardware and software.

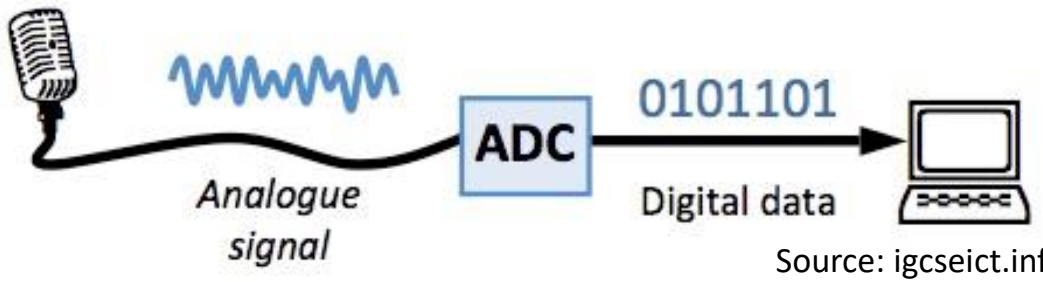
Analogue and Digital Data

What is Analogue data?

- Physical data that changes smoothly from one value to the other.
- E.g: temperature measurement

What is digital Data?

- Can only be represented by discrete or discontinuous values (1 and 0).
- This is the only type of data understood by computers.



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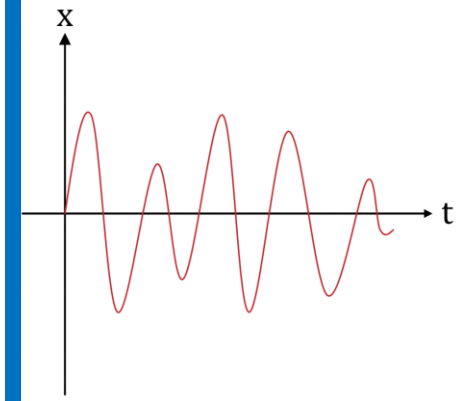
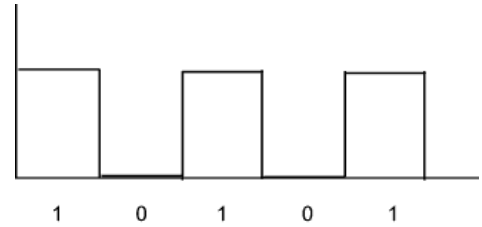


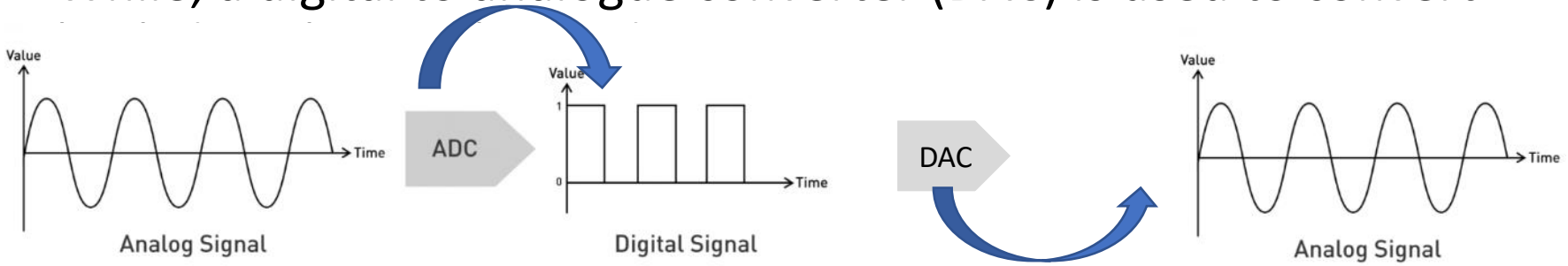


Chap 1: Types and Components of computer systems

1.1 Hardware and software.

Analogue and Digital Data cont..

- The computer can only understand digital data (1 and 0s)
- Our real world data, measurements is in analogue form.
- How do we transform this analogue data to digital data and back?
- An analogue to digital converter (ADC) is used to convert analogue to digital data.
- While, a digital to analogue converter (DAC) is used to convert



Chap 1: Types and Components of computer systems
1.2 Main Components of a computer

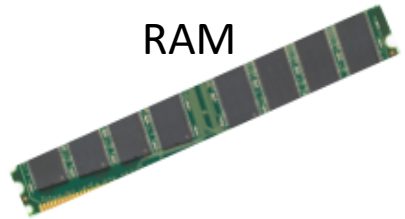
- A typical computer has four (4) main components: the central processing unit (CPU), internal hard disk drive or solid-state drive, random access memory (RAM) and read-only memory (ROM).
- These are mainly hardware that are necessary for a computer to function properly.

CPU

HDD

SSD

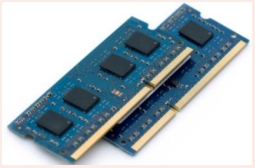
RAM



ROM

Chap 1: Types and Components of computer systems

1.2 Main components of a computer cont..

Main component	Description
Central Processing Unit (CPU) 	• The CPU is the brain of the computer. • It has an Arithmetic and Logic Unit (ALU) for calculations and logical decisions • A control unit for control of input and output devices • And small memory locations (registers) for storage of data for processed.
Random Access Memory (RAM) 	• Primary internal memory for temporal data storage. • Volatile memory, content lost when computer goes off • Can be written to and read from • RAM size can be increase to improve computer speed.
Read Only Memory (ROM) 	• Primary internal memory for permanent storage of small data (boot instructions & system configurations) • Non-volatile memory, can only be read from • Use to store BIOS and other instructions for starting up the computer
Internal Hard disk drive or Solid State Drive 	• Permanent storage for large amounts of data, • Stores applications, operating systems and files, • They can be fixed or removable.

Chap 1: Types and Components of computer systems
1.2 Main components of a computer cont..
Input and Output devices

- Comparison between input and output devices.

Input device	Output device
• Hardware like keyboard, mouse, microphone, touchscreens etc. • Enable entry of data or instructions into a computer. • Can be complicated to use, especially keyboards. • Input devices can only send data to devices and not vice versa.	• Hardware like monitor (screen), speakers, printers, projectors etc. • They allow processed data to be seen by user on screen or as hardcopy. • Less complex as they only have to output already processed data. • Only capable of receiving data to generate an output, and can not do the reverse.

Chap 1: Types and Components of computer systems
1.2 Main components of a computer cont..
Internal memory and Backing storage

- Comparison between internal memory and backing storage

Internal memory	Backing storage
• Internal memory or primary storage is the main memory which is directly accessible by the CPU. It consist of RAM and ROM • RAM and ROM are much smaller in memory • RAM stores data temporally, while ROM contents are permanent but only readable. • RAM and ROM have very fast data access times. • RAM and ROM are internal memories; hence internally fixed inside a computer	• Backing storage refers to permanent storage of large amounts of data on devices such as internal Hard Disk Drive (HDD) or Solid State Drive (SSD) • Larger storage memories than RAM and ROM • Stores data, files, operating system, software's, permanently. • Backing storage has longer data access times compared to RAM and ROM. • HDD and SSD can either be fixed or removable

Chap 1: Types and Components of computer systems

1.3 Operating Systems (OS)

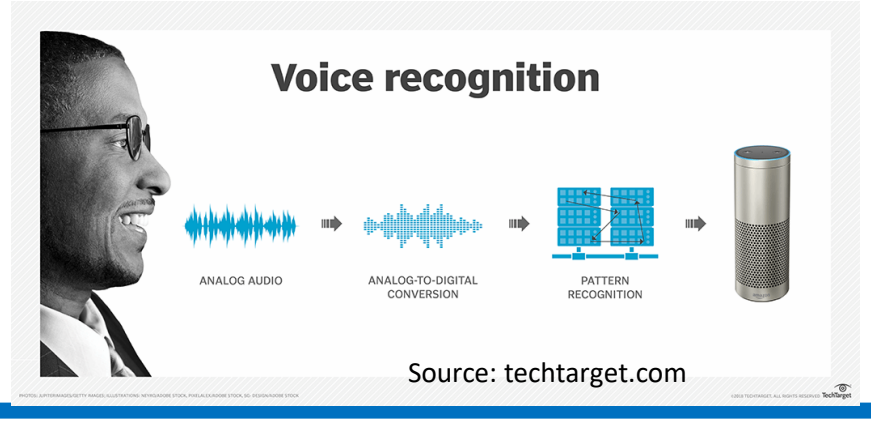
What are operating systems?

- This is software that runs in the background of a computer and manages basic functions of the computer.
- Operating systems like Windows, Macintosh, Linux, Ubuntu etc make the computer very user-friendly.
- Operating system in a computer performs the following general tasks:

i. allows communication between user and the computer system,
ii. control of input, output and backing storage operations
iii. controls the loading, running and storage of applications programs
iv. dealing with errors that occur in application programs,
v. maintains security in the whole computer system,
vi. keeps detailed computer usage.

Chap 1: Types and Components of computer systems
1.3 Operating systems
User Interfaces

- The operating system allows communication between the user and the computer with the help of a user interface.
- We will discuss four main user interfaces: Command line interface (CLI), graphical user interface (GUI), dialogue-based user interface, and gesture-based user interface.



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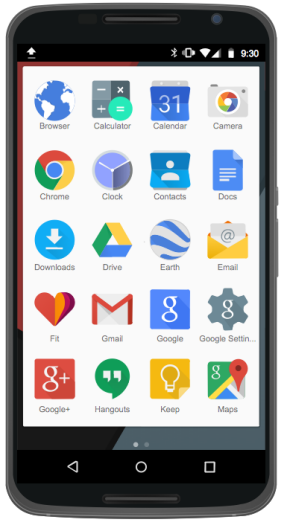
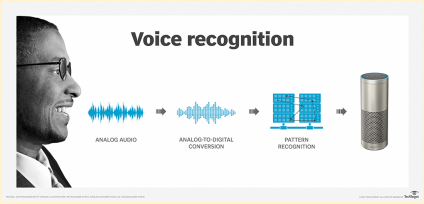


Chap 1: Types and Components of computer systems

1.3 Operating systems

Description of different User Interfaces

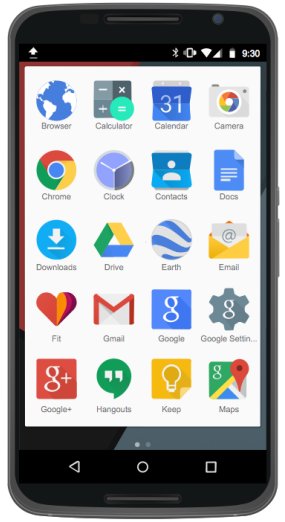
Type of User Interface	Description and major points
Command Line Interface (CLI) 	• The user needs to learn commands to carry out basic operations like opening apps, selecting from a menu.. • The user is in direct communication with the computer • The user can alter computer configuration settings • Uses little computer memory
Graphical User Interface (GUI)	• Allows communication between user and computer using icons. • Uses technologies like WIMP(windows icons menu and pointing device) which enable use of mouse to control a cursor on a screen.
Dialogue-based User Interface 	• Uses the human voice to give commands to a computer system. E.g Modern cars, automated home systems etc.
Gesture-based User Interface.	• Makes use of computer vision and image processing. • Uses gestures like moving of hands or head to allow humans to interface with a computer without the need for any mechanical devices.

Chap 1: Types and Components of computer systems

1.3 Operating systems

Comparison between CLI and GUI

User Interface	Advantages	Disadvantages
CLI	• User is in direct communication with computer, • Uses little computer space	• User needs to learn many commands • Takes a lot of time to complete simple task.
GUI	• User does not need to learn any commands • Programs can be accessed by simply clicking on icons.	• Uses up a lot of computer space • User is restricted to only icons on screen.



Chap 1: Types and Components of computer systems

1.3 Operating systems

Comparison between dialogue-based interface and gesture-based interface

User Interface	Advantages	Disadvantages
Dialogue-based interface	• Very useful for disabled people • No need for physical contact with system • Voice recognition can be used on security system.	• User needs to learn and only use acceptable commands • Words or speech must be very clear, and repetition of words is often needed.
Gesture-based interface	• User does not need to learn any commands • Programs can be accessed by simply clicking on icons.	• Unintentional movements by user can be picked up. • User needs to be very close to the system to work well.

Chap 1: Types and Components of computer systems
Past Questions

Q>> Computer operating systems have developed since early computers used Command Line Interfaces (CLI). Many computers now use Graphical User Interfaces (GUI), some of which are capable of using touch screen technology. Compare and contrast CLI and GUI. [8]

IGCSE ICT(0417) Paper 11 Q14, May/June 2017

Chap 1: Types and Components of computer systems

Answer to question 2

Answers may make reference to, for example:

- Post GUI allows the use of pinching, scrolling, expanding
- Post GUI allows the use of touch screen but a CLI does not allow for this
- Icons speed up finding instructions, CLI you have to type out the commands in full
- No editing in CLI
- GUI more user friendly CLI the commands have to be memorized
- Due to graphics GUI uses a lot of memory, CLI is a lot smaller program
- GUI cannot operate properly if memory is low
- CLI and GUI both carry out file management CLI and GUI use similar utilities
- Both are operating systems
- Both control the hardware and software

Source IGCSE ICT MJ MS 2017

Chap 1: Types and Components of computer systems

1.4 Types of computers

The common types of computers are:

- Desktop computers
- Laptop computers
- Tablets
- Smartphones

Chap 1: Types and Components of computer systems

1.4 Types of computers

Description, advantages and disadvantages

Type of computer	Description
Desktop Computers/ Personal Computer(PC) 	• A general purpose computer made up of a separate monitor, keyboard, mouse and processing Unit fixed in one position. • Mainly used in offices, education, gaming etc. **Advantages:** • Parts are easily available and less costly • Better specifications for a given price compared to laptops • Easier to upgrade or expand • Stable internet since computer is fixed in one location. **Disadvantage:** • They are not portable due to separate parts and bulky nature • Takes up much space • Separate parts need to be connected with cables
Laptop 	• Monitor, mouse, keyboard and processor are in one single Unit • Key features: low power consumption, lightweight, less heat • Main uses: office, business, education, gaming, entertainment etc. **Advantages** • Very portable compared to desktops • No lagging wires that can cause hazards • Take up less space since all parts are in a single unit and easy to use with Wi-Fi **Disadvantages:** • Sometimes difficult to use due to arrangement of parts. • Not easy to upgrade as in desktops

Chap 1: Types and Components of computer systems

1.4 Types of computers

Description, advantages and disadvantages

Type of computer	Description
Tablet 	• Mobile computers with all components in a single unit. • Makes use of touch screen technology instead of conventional keyboard and mouse. Keyboards and mouse are optional • The keyboard is a virtual part of the touchscreen that can be accessed by touching keys with a finger or stylus. Internet access is through Wifi or 3G/4G/5G connectivity **Advantages:** • Very portable, long battery life, • little heat generated • Can use several apps • Has built in camera, MP3/MP4 players etc. **Disadvantage:** • Limited storage memory compared to laptops • Typing on touchscreen is often slow and error-prone
Smartphones 	• Mobile computers that allow phone calls, messaging, fast internet connectivity emailing, MP3/4, photos etc. • Come in various operating systems (android, iOS, Windows) • Makes use of Wi-Fi or 3G/4G/5G mobile phone networks. **Advantages:** • Very small in size and lightweight (very portable) • Can be use for calls, messaging and surfing on the go. **Disadvantages:** • Small screens makes reading and typing difficult • Surfing the net often drains battery quickly • Smaller memory size compared to laptops

Chap 1: Types and Components of computer systems

Past Questions

1) There are a number of different types of computer. Write down the type of computer that best fits the following descriptions.

a) A computer that is difficult to move and has a separate monitor and keyboard. [1] Desktop computer

b) A portable computer that includes a physical keyboard. [1] laptop

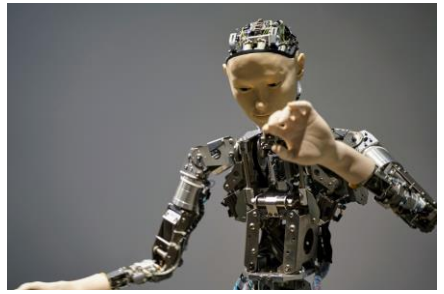
c) A thin portable computer that has a touch screen and a battery in a single unit, not normally used to make phone calls. [1] tablet

d) A mobile phone that can be used as a computer. [1] Smartphones

IGCSE ICT (0417) Paper 12 Q1, February/March 2016

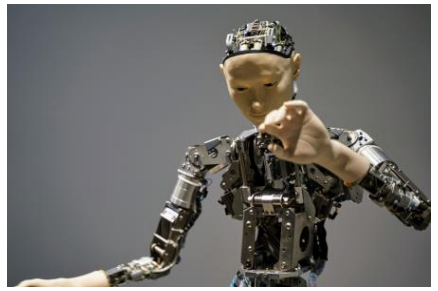
Chap 1: Types and Components of computer systems
1.5 Emerging Technologies
Impacts of emerging technologies: AI

- Artificial Intelligence (AI) : AI is a machine or application that simulates or mimics human intelligence.
- This technology tries to make robots or computer behave like humans by operating machinery like humans, speaking human language, recognizing different peoples faces, analyzing data and making predictions (weather forecasting, temperature control etc.)



Chap 1: Types and Components of computer systems
1.5 Impacts of emerging technologies
Impacts of AI on everyday life

- Driverless vehicles making use of AI to navigate and drive are currently under development and may change the transport network in future.
- Use of AI in robots is aiding in carrying out dangerous tasks like space exploration, bomb disarming and disposals, car manifesting (spraying welding etc)
- Robots are helping in medicine through development of robotic body parts and performing precision surgeries.
- Loss of jobs, skills and possible future challenges.

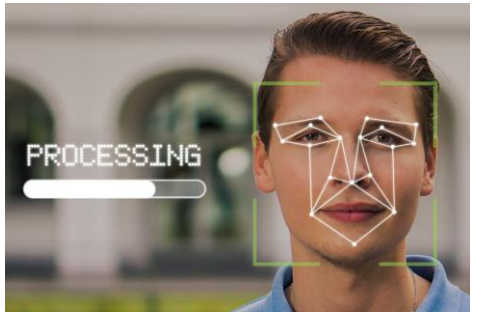


Chap 1: Types and Components of computer systems

1.5 Emerging technologies

Biometrics and its impacts

- Biometrics : This is a technology that uses some body parts (finger prints, eye, face) for identification by recognizing parts unique for an individual. Biometrics uses unique distinctive features in humans to create unique identifications.
- Finger printing: a specific finger(s) is used to get access to a system
- Facial Recognition: Scans your entire face and matches to a database in order to get access to a system, building or device.
- Eye recognition: Scans the iris of the eye compares to database for recognition and access to a system, building or device.



Chap 1: Types and Components of computer systems

1.5 Emerging technologies

Extended Reality (XR) and its impacts

- XR is immersive technologies that either blend a virtual world to our real world or creates and entire fully immersive experience. Examples are:
- Virtual Reality (VR); creates a virtual (unreal) digital environment for user.
- User is fully immersed in a simulated digital world.
- Makes use of VR headsets, googles, gloves for hearing, seeing and feeling respectively.
- Can be used in education, medicine, entertainment, business, sport, etc.

Source: iedute.com

Chap 1: Types and Components of computer systems

1.5 Emerging technologies

Augmented Reality (AR) and its impacts

- Augmented Reality (AR); allows user to experience a relationship between virtual and real world by overlaying virtual information onto real-world situations.
- The AR world can be experienced using special googles or using smartphone /phablet screens.
- User is not isolated from real world, can interact and sea real world occurrences.
- Example is the Pokemon GO game which overlays digital creatures onto real-world situations
- Future impacts may include: safety and rescue, entertainment, health care, business.

Source: iedute.com

Chap 1: Types and Components of computer systems
1.5 Impacts of emerging technologies
Other Emerging technologies

- CAT
- Quantum Cryptography
- 3D Holographic Imaging