

# IG CS Topic 6.4 Artificial Intelligence

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## Artificial Intelligence (AI)

- AI is a **branch** of computer science dealing with the **simulation of intelligent behaviours by computers**
  - the development of programs to **simulate human behaviour**
- examples include **Face Recognition** (Face ID) and **Speech recognition**

## Characteristics of AI

1. **Collection of data**
  - AI needs a **data input**
    - can be either from users (e.g., face recognition) or sensors (e.g., infra-red sensors)
2. **A set of programmed rules**
  - how to use the *collection of data*?
  - stored for the program to use to **make decisions**
3. **The ability to reason**
  - AI needs to establish **facts from rules and logic**
    - such as  $A = B$ ,  $B = C$ , then  $A = C$
4. **The ability to learn and adapt**
  - **not all** AI do this, only *machine learning* can achieve this
  - Machine learning is able to find the **patterns** inside the data (learn)
  - when the input changes, machine learning is able to **change** the pattern recognized (adapt)

## Expert Systems

- a system that attempts to **replicate the knowledge of an expert**
  - the system asks the user questions to determine the solution or answer
    - it will ask different questions depending on each answer given by the user

## Characteristics of expert systems

### 1. Knowledge base

- a list of **facts**
  - e.g. there is a green light below the power symbol / the printer is on

### 2. Rule base

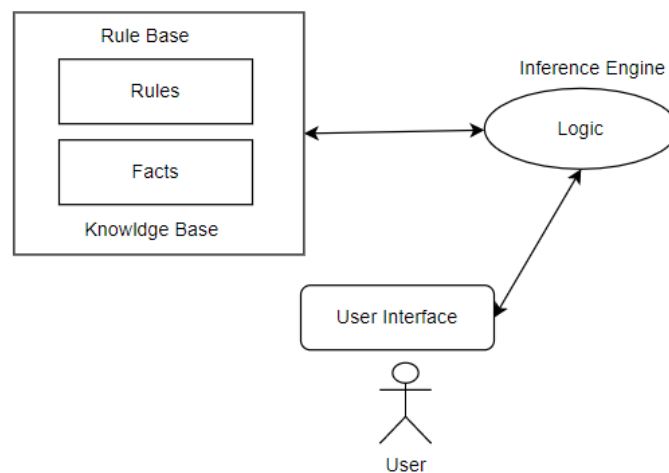
- stores the rules based on the knowledge
- a list of **rules** that link the facts
  - e.g. when there is a green light below the power symbol, the printer is on

### 3. Inference engine

- makes **decisions** about which question to be asked next

### 4. User interface

- interacts with the users
- outputs questions and statements to the user, and allows the users to input data



## Machine Learning

- a program that has the ability to **automatically adapt its own processes and/or data**
- **training** is involved in machine learning
  - training is the process in which machine learning programs adapt their system (rules) based on the data inputted

Check out how to carry out a machine learning program through <https://www.kaggle.com/code/hardyywww/ml-x-ai-regression-with-numpy-overview>

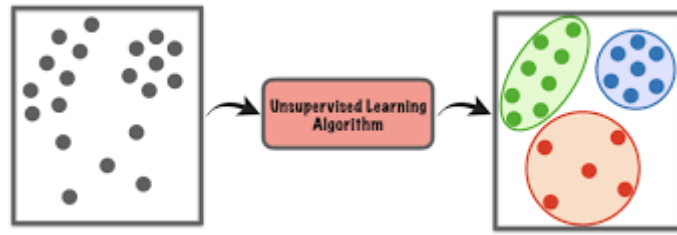
## Types of machine learning

### 1. Supervised Learning

- when the user is telling the program **what the data means**
- the input data is associated with a target object
  - e.g. in image recognition, we tell the program that an image belongs to a horse and the other image belongs to a dog and so on

## 2. **Unsupervised Learning**

- when the inputted data is not associated with a target object
- the program finds patterns from the data itself (learns the data on its own)



- In this photo, the program just sorts the data into three groups as points in a specific group are near to each other