

IG CS Topic 6.4 Artificial Intelligence

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- IG CS Topic 6.4 Artificial Intelligence
 - Artificial Intelligence (AI)
 - Characteristics of AI
 - Expert Systems
 - Characteristics of expert systems
 - Machine Learning
 - Types of machine learning

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 $A = B, B = C, \text{ then } A = C$
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

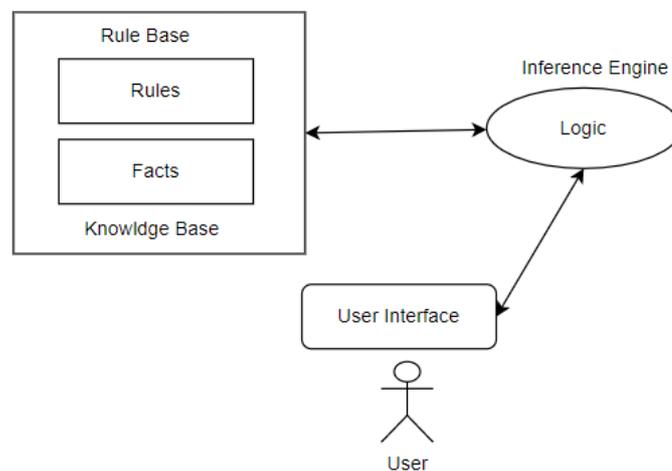
- stores the rules based on the knowledge
- a list of **rules** that link the facts
 - e.g. when there is a green light below the power symbol, the printer is on

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/c/ode/hardyywwwwww/ml-x-ai-regression-with-numpy-overview>

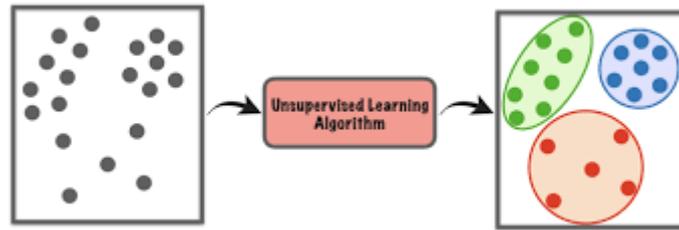
Types of machine learning

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