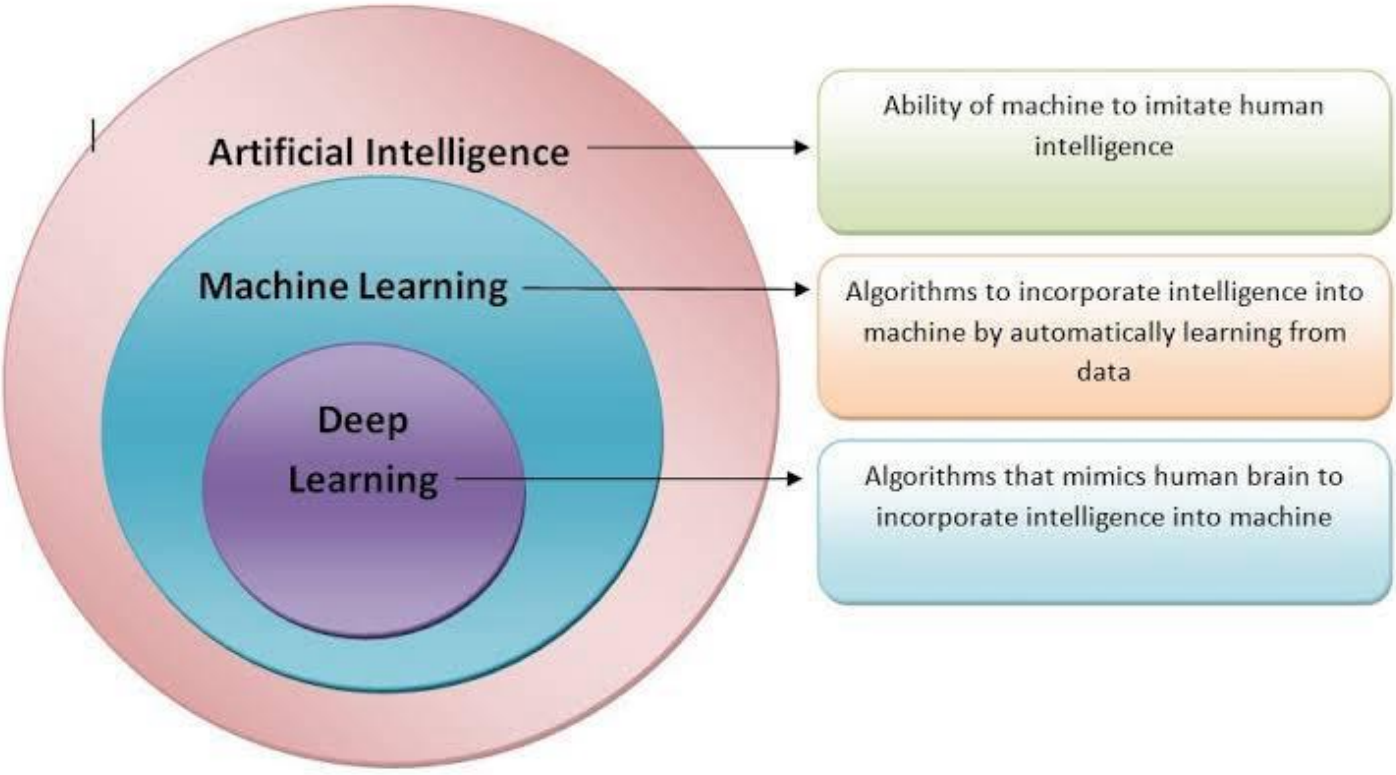
Neural Network and Deep Learning

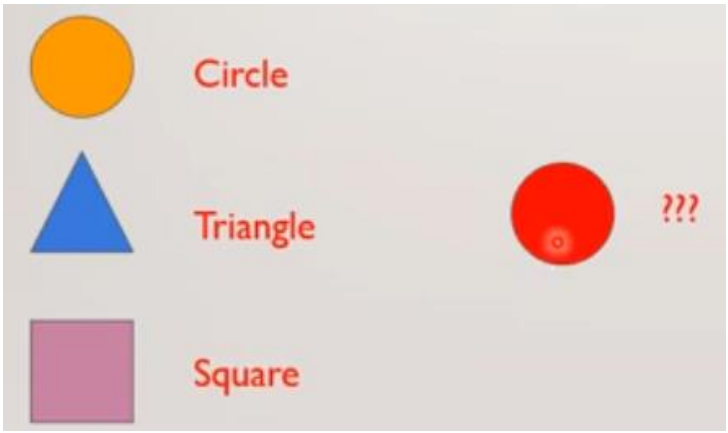
Section 1

Difference between AI, ML, DL:



Types of Machine Learning in general:

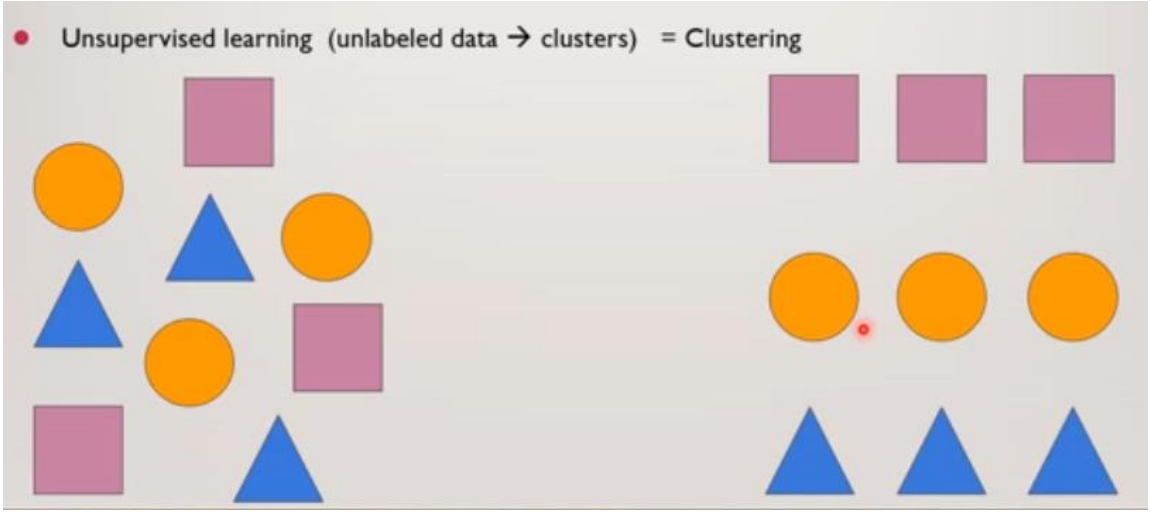
1. **Supervised Learning:**
   - The model learns from labeled data, where each input has a corresponding output.
   - Example on classification:



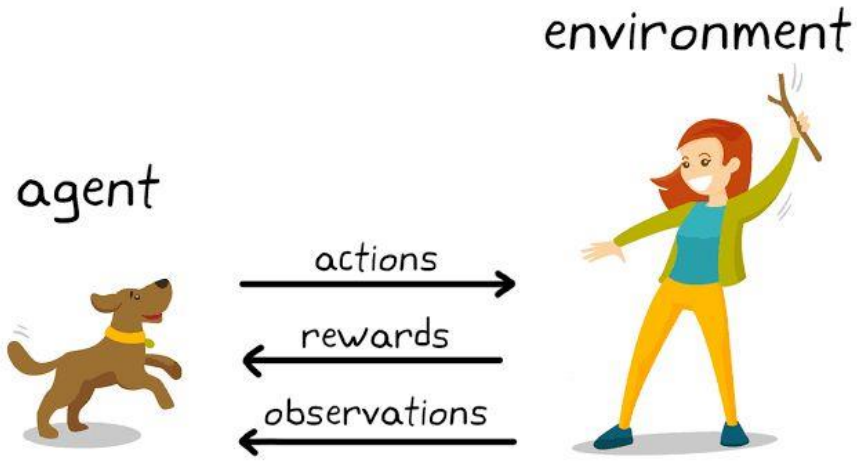
   - Example on regression:

     Predicting house prices based on their areas.

2. **Unsupervised Learning:**
    - The model identifies patterns without labeled outputs.
    - Example:



3. **Reinforcement Learning:**
    - The model learns by interacting with an environment and receiving rewards.
    - Example:



1. Suppose you are working on weather prediction and use a learning algorithm to predict tomorrow's temperature (**in degrees Centigrade/Fahrenheit**). Would you treat this as a classification or a regression problem?

a) **Regression**
b) Classification

Predicting tomorrow's temperature (numerical value) → Regression

- هنا إحنا بنتكلم عن رقم (درجة الحرارة بالأرقام)، يعني إحنا بنتوقع قيمة مستمرة
- أي حاجة فيها أرقام ونحتاج نعرف قيمتها بالضبط بنسميها (Regression)

2. Suppose you are working on weather prediction, and your weather station makes one of three predictions for each day's weather: Sunny, Cloudy or Rainy. You'd like to use a learning algorithm to predict tomorrow's weather. Would you treat this as a classification or a regression problem?

a) Regression
b) Classification

Predicting tomorrow's weather (Sunny, Cloudy, Rainy) → Classification

- هنا الاختيارات مش أرقام، دي فئات(Categories) ، إما "مشمس" أو "غائم" أو "ممطر".
- أي حاجة فيها تصنيفات واضحة بنسميها (Classification)

3. Suppose you are working on stock market prediction توقعات سوق الأوراق المالية, and you would like to predict the price of a particular stock tomorrow (measured in dollars). You want to use a learning algorithm for this. Would you treat this as a classification or a regression problem?

a) Regression

b) Classification

- **Predicting a stock's price (numerical value in dollars) → Regression**
- توقع سعر السهم بكرة بالدولار
- السعر هنا قيمة مستمرة (رقم)، يعني إحنا بنتعامل مع (Regression)

4. Suppose you are working on stock market prediction. You would like to predict **whether or not a certain company will declare bankruptcy (تعلن افلاسها) within the next 7 days** (by training on data of similar companies that had previously been at risk of bankruptcy). Would you treat this as a classification or a regression problem?

a) Regression

b) **Classification**

Predicting if a company will go bankrupt (Yes/No) → Classification

- توقع إفلاس شركة خلال ٧ أيام
- الشركة إما تفلس أو لا تفلس، يعني فئتين(Yes/No) ، وبالتالي ده (Classification)

5. Suppose you are working on stock market prediction, typically tens of millions of shares of Microsoft stock are traded(تداول اسهم مايكروسفت) (i.e., bought/sold) each day. You would like to predict the number of Microsoft shares that will be traded tomorrow عدد أسهم مايكروسوفت التي سيتم تداولها غدا Would you treat this as a classification or a regression problem?

a**) <u>Regression</u>**
b) Classification

Predicting the number of Microsoft shares traded tomorrow (numerical value) → Regression

- توقع عدد الأسهم اللي هتتباع بكرة
- عدد الأسهم ده رقم متغير، مش تصنيفات، فإحنا بنتعامل مع .(Regression)

6. Some of the problems below are best addressed using a supervised learning algorithm, and the others with an unsupervised learning algorithm. Which of the following would you apply supervised learning to? (Select all that apply.) In each case, assume some appropriate dataset is available for your algorithm to learn from.

a) Given historical data of children's ages and heights, predict children's height as a function of their age.

Predicting children's height based on age (<u>supervised</u>)

- التنبؤ بطول الأطفال بناءً على عمرهم (Supervised) عندنا بيانات الأعمار والطول، فالنموذج بيتعلم العلاقة بينهم.

b) Given 50 articles written by male authors, and 50 articles written by female authors, learn to predict the gender of a new manuscript's author (when the identity of this author is unknown).

Predicting an author's gender from a manuscript (supervised)

- التنبؤ بجنس كاتب المقال (Supervised) عندنا أمثلة سابقة لمقالات كتبها ذكور وإناث، فالنموذج يتعلم منها.

c) Take a collection of 1000 essays written on the US Economy, and find a way to automatically group these essays into a small number of groups of essays that are somehow "similar" or "related". خذ مجموعة من ١٠٠٠ مقال مكتوبة حول الاقتصاد الأمريكي، وابحث عن طريقة لتجميع هذه المقالات تلقائيًا في عدد صغير من مجموعات المقالات التي تكون بطريقة ما "متشابهة" أو "مرتبطة".

Grouping essays based on topics (unsupervised)

- تجميع المقالات المتشابهة تلقائيًا (Unsupervised) مفيش بيانات بتقول إن المقال ده يتبع فئة معينة، النموذج بيكتشف الفئات بنفسه.

d) Examine a large collection of emails that are known to be spam email, to discover if there are sub-types of spam mail.

Finding subtypes of spam emails (unsupervised)

- اكتشاف أنواع البريد العشوائي (Spam Subtypes) (Unsupervised) النموذج بيبحث عن أنماط مختلفة بدون بيانات مسبقة.

7. Some of the problems below are best addressed using a supervised learning algorithm, and the others with an unsupervised learning algorithm. Which of the following would you apply supervised learning to? (Select all that apply.) In each case, assume some appropriate dataset is available for your algorithm to learn from.

a) Given data on how 1000 medical patients respond to an experimental drug (such as effectiveness of the treatment, side effects, etc.), discover whether there are different categories or "types" of patients in terms of how they respond to the drug, and if so what these categories are.

Finding categories of patients based on drug response **Unsupervised**

- اكتشاف أنواع المرضى بناءً على استجابتهم للدواء (Unsupervised)مفيش مخرجات واضحة، النموذج بيكتشف الأنماط.

b) Have a computer examine an audio clip of a piece of music, and classify whether or not there are vocals (i.e., a human voice singing) in that audio clip, or if it is a clip of only musical instruments (and no vocals).

Identifying whether a music track contains vocals or not(**Supervised)**

- تصنيف مقطع صوتي لمعرفة إذا كان يحتوي على غناء أو لا (Supervised) عندنا أمثلة سابقة لأصوات فيها غناء وأخرى بدون غناء، فالنموذج بيتعلم منها.

c) Given genetic (DNA) data from a person, predict the odds of him/her developing diabetes over the next 10 years.

Predicting a person's risk of diabetes using genetic data **Supervised**

- التنبؤ بإصابة شخص بالسكري بناءً على الجينات → (Supervised) عندنا بيانات تاريخية عن الناس اللي أصيبوا بالسكري والنموذج بيتعلم العلاقة.