**MACHINE LEARNING SPECIALIZATION**

**DEEPLEARNING.AI**

Week 01

By Arthur Samuel in 1959:

Machine learning is the field of study that gives computers the ability to learn without being explicitly programmed.

In 1950 Arthur created a chess game that computers can play, and computer played that game 10,000 times to itself to get what is the good position and what is the bad position to win the game, and Arthur himself didn’t know about chess.

Machine learning algorithms:

1. Supervised Learning(used most in real world applications) (Course 1, Course 2)
2. Unsupervised Learning(Course 3)
3. Recommend systems
4. Reinforcement learning

**Supervised Learning:**

Creating a mapping from X input to Y output, in which we give our model some X input with correct Y labels to actually teach the computer on those conditions what is true, so computer can learn and then later on it can make better predictions.

**Applications of Supervised Learning:**

1. Input X (email) 🡪 🡪 🡪 Output Y (spam? 0/1) | Application (Spam filtering)
2. Input X (audio) 🡪 🡪 🡪 Output Y (text transcripts) | Application (speech recognition)
3. Input X (English) 🡪 🡪 🡪 Output Y (Spanish) | Application (machine translation)
4. Input X (ad, user info) 🡪 🡪 🡪 Output Y (click ? 0/1) | Application (Online advertising)
5. Input X (image, radar info) 🡪 🡪 🡪 Output Y (position of other cars) | Application (Self-driving cars)
6. Input X (image of phone) 🡪 🡪 🡪 Output Y (defect ? 0/1) | Application (Visual inspection)

**Regression**: Where the task is to predict a number from infinite number of possibilities. House price prediction for example. And remember the point is to add a best fit line on our data to actually capture the true data from training data. Maybe straight line isn’t enough so we can add a little curve line that captures the most patterns

**Classification**:

These algorithms are used to predict categories. Whether a person have malignant(a lump that is dangerous or cancerous) or benign(a lump that isn’t that dangerous or isn’t cancerous) in breast cancer detection situation.

In classification problems , people can use terminologies like class or category but that both are same.

In classification problems, you can have multiple categories for example our breast cancer detection can also tell different type of cancer which maybe in our dataset reffered to as “Malignant type 2”, then we can also predict that so in short our classification problem can have multiple categories.

**Difference BW Regression and Classification:**

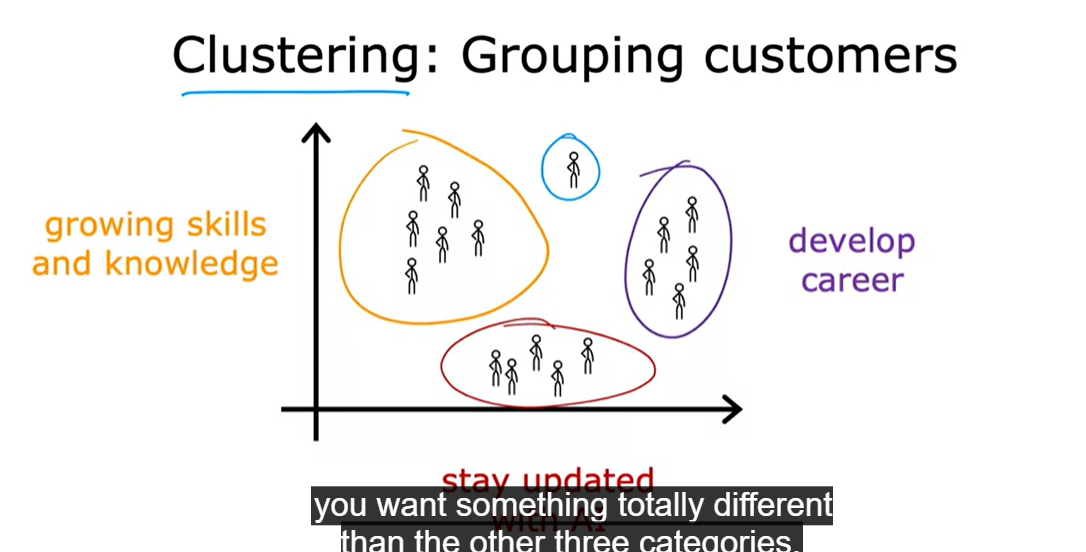
Classification can predict limited, possible number from a set of finite categories such as 0,1 or 0,1,2 but not all possible numbers between them like 0.5, 0.7 etc.

We can use more than one input value to predict the output. Not just the size of the tumor in this case, maybe a patient age and tumor size are both in combination using to predict whether the person has benign or malignant.

**Unsupervised Learning:**

It is a type of machine learning that learns from data without human supervision. Unlike supervised learning, unsupervised machine learning models are given unlabeled data and allowed to discover patterns and insights without any explicit guidance or instruction.

A **clustering algorithm** is a part of it, and how it works is basically it groups together the data those patterns are somehow relatably same. For example on deep learning . ai , we want to group customers on the basis of the reasons like why they are here on our platform.



Clustering algorithm takes data without labels and tries to automatically group them into clusters.

Maybe we can also take an example of google news , have you ever wondered how it groups the news on to one category that define all of those news ?



The reason how it clusters into one group that it it somehow finds some patterns in all four news like for example the words like panda, zoo, birth, twin are in also other news so it groups them into a cluster by using clustering algorithm.

Let’s take a look at unsupervised learning algorithms other than clustering.

In unsupervised learning, data only comes with inputs X, but not with output labels y. because in supervised learning we know that we also get output labels in the data but for unsupervised learning there is no supervision. Data only comes with X.

We have looked at clustering algorithm which groups similar data points together.

**Anomaly Detection:** Which is used to detect unusual events. Find unusual data points. For example detecting a fraud transaction where unsual events, unusual transactions could be signs of fraud and for many other applications.

**Dimensionality reduction:** Compress data using fewer numbers, for example compressing a big data losing a little information as possible.