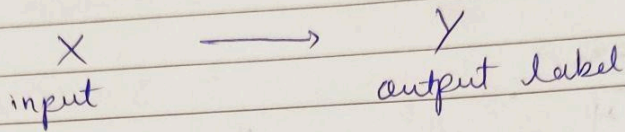


1. Supervised Learning.

Algorithms that learn from X to Y

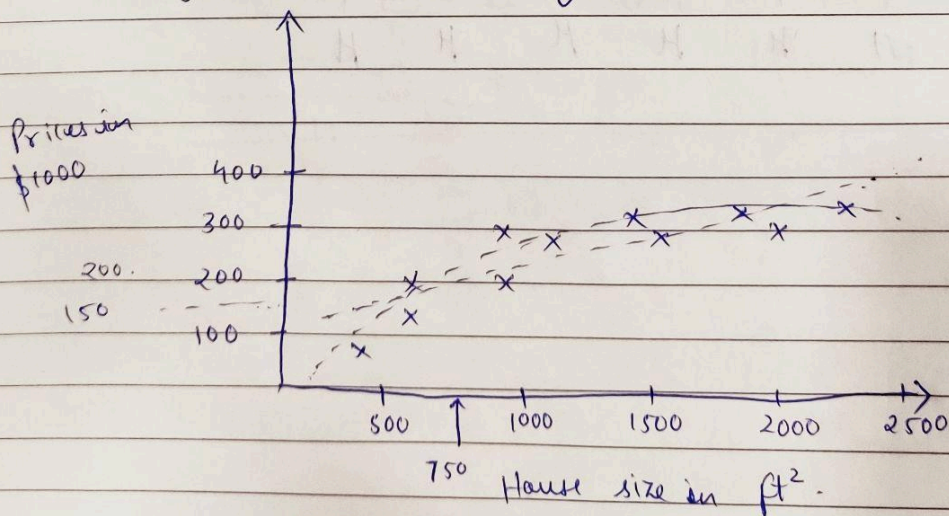


Learn from being given "right answers".

I. Examples:

Input (x)	Output (x)	Application.
email	spam (0/1)	spam filtering.
audio	text transcripts	speech recognition
English	Spanish	machine translation
ad, user info	click? (0/1)	online advertising
image, radar info	positions of other cars	self driving car.
image of phone	defect (0/1)	visual inspection.

II. Regression: Housing price prediction.



What is the price of 750 ft^2 home?

the algo can use a straight line to give you the info.

so, using straight line, we get 150k as the price.

Using a curve, we get 200k as the predicted price.

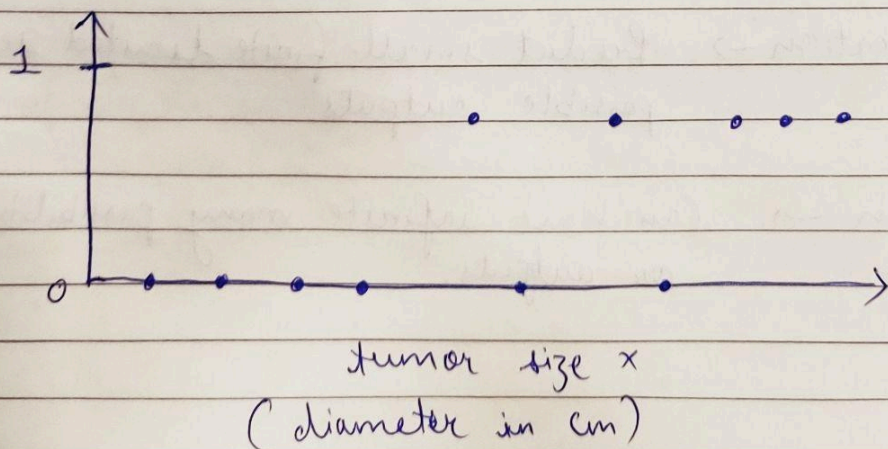
The above is an example of supervised learning.

Regression - Predict a number (it has infinitesimally many possibilities)

III. Classification: Breast Cancer detection.

a tumour 1 \rightarrow malignant (Cancerous)
0 \rightarrow Benign (normal tumour)

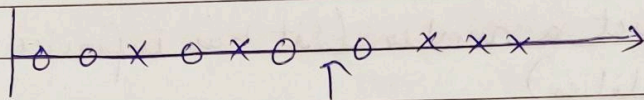
size	diagnosis.
2	0 \rightarrow Ben
5	1 \rightarrow Cancerous
1	0
7	1 \rightarrow Cancerous.
:	



This is very different from regression.
We are just classifying two things here instead of infinite other possible numbers.

Since there are only two possible categories, we have a classification.

Now, if we plot our graph on a straight line, we have:



For a given tumor size, is it benign or malignant?

In classification, we can have multiple ~~of~~ output categories. (classes).

e.g. o - benign x - malignant
 Δ - malignant type 2.

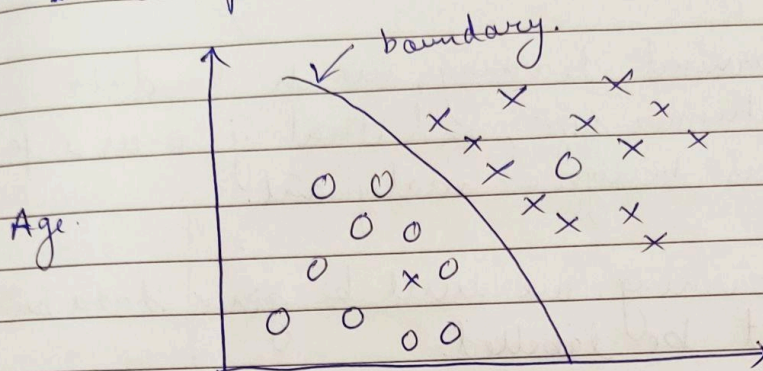
Classification → predict categories.

given a image, is it cat or dog?

Classification → Predict small finite limited set of possible outputs

Regression → Can have infinite many possibilities or outputs.

Example: Two or more Inputs.



Tumor size

o → benign
x → malignant.

Using patient age and tumor, the learning algorithm might create a boundary which separates benign and malignant tumors.

Summary:

Supervised learning.

- Learns from being given "right answers".

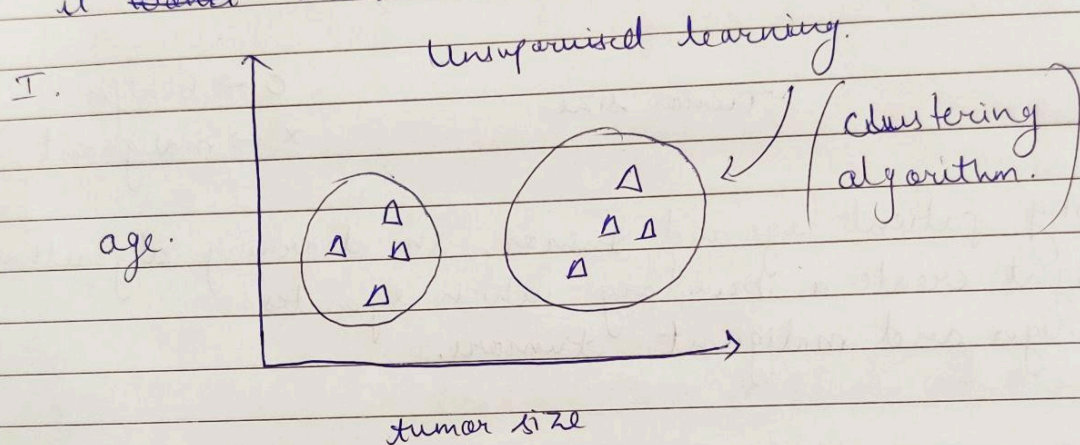
- Regression (predict a number. ~~that~~ Infinitely many possible outputs).

- Classification (predict categories. Small ~~new~~ number of possible outputs).

2. Unsupervised Machine Learning

An example, in supervised learning, we had data about age and tumor size, and that gave us info whether it was benign or malignant.

In unsupervised learning, we will be given data but it ~~won't~~ won't be labelled.



So, the dataset does not have any labels.

Our job is to find some structure or pattern in our data.

Find something interesting in unlabeled data.

Clustering is used in Google news. It groups related stories together.

An example, a news about Pandas. Google will cluster all articles about pandas in Google news.

II. Clustering: DNA microarray.

(genes)
each row

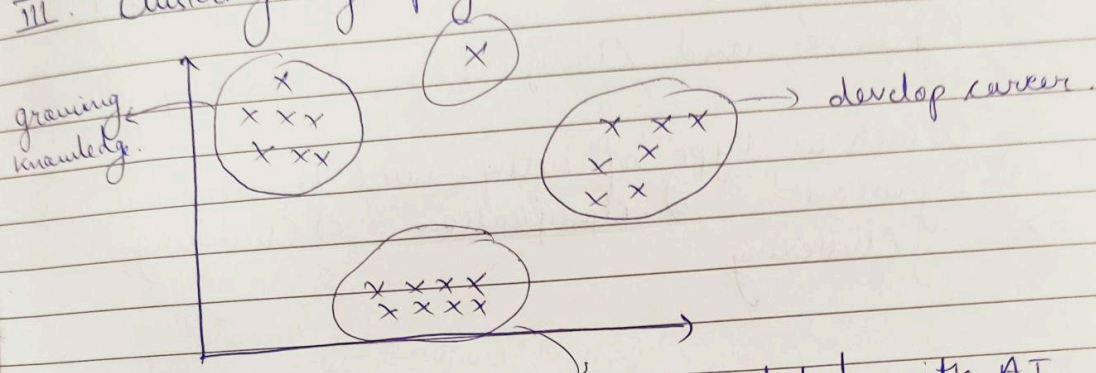
individuals.

(each column).

run clustering algo to group different types of people.

this clustering is unsupervised learning.

III. Clustering: Grouping Customers.



example of people.

in Deep learning. AI community.

In unsupervised learning, data comes with input x , but not output labels y .
Algorithm has to find structure in the data.

Clustering: Group similar data points together.

Anomaly detection: Find unusual data points.

Dimensionality reduction: Compress data using fewer numbers.

Examples of unsupervised learnings

- a set of news articles found on the web, group them into sets of articles about the same stories.
- Given a DB of customer data, automatically discover market segments and group customers into different market segments.

Since email is ~~not~~ usually labeled, it is a supervised learning.

3. Exercise on supervised and unsupervised learning.

1. Which are two common types of ~~sup~~ supervised learning?

Regressive and Classification. [Clustering is not]

2. Which is type of unsupervised learning?

a) Regression b) classification c) Clustering

=> Clustering