Introduction to

Classification

But first

Small Recap

Intro to Python Programing

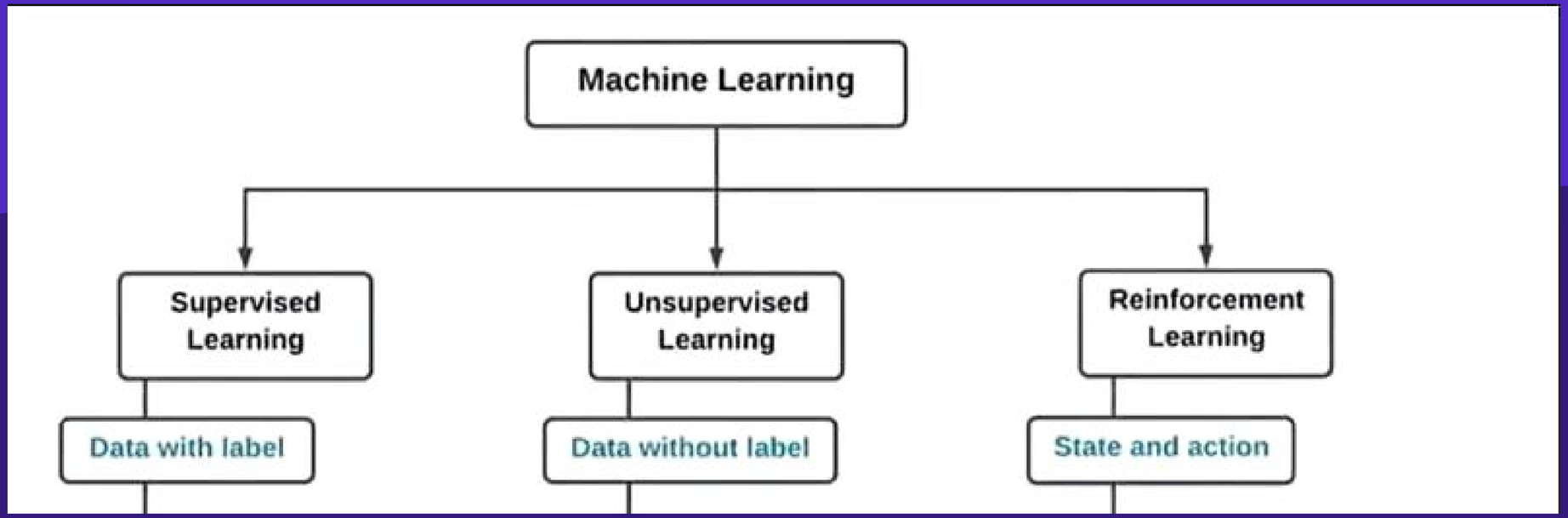
Intro to AI and machine learnign

Linear regression

Classification

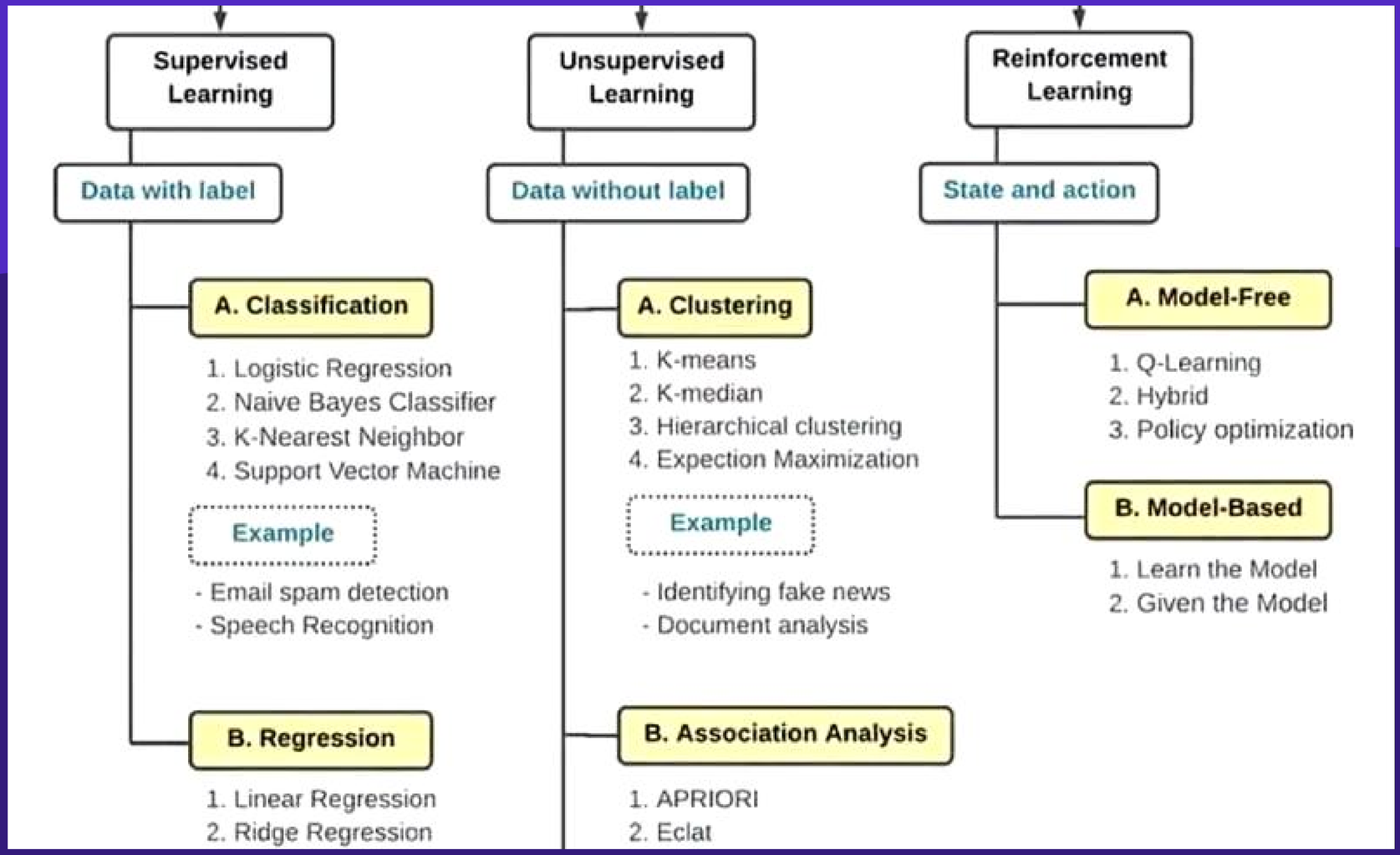
Small recap

Types of learning



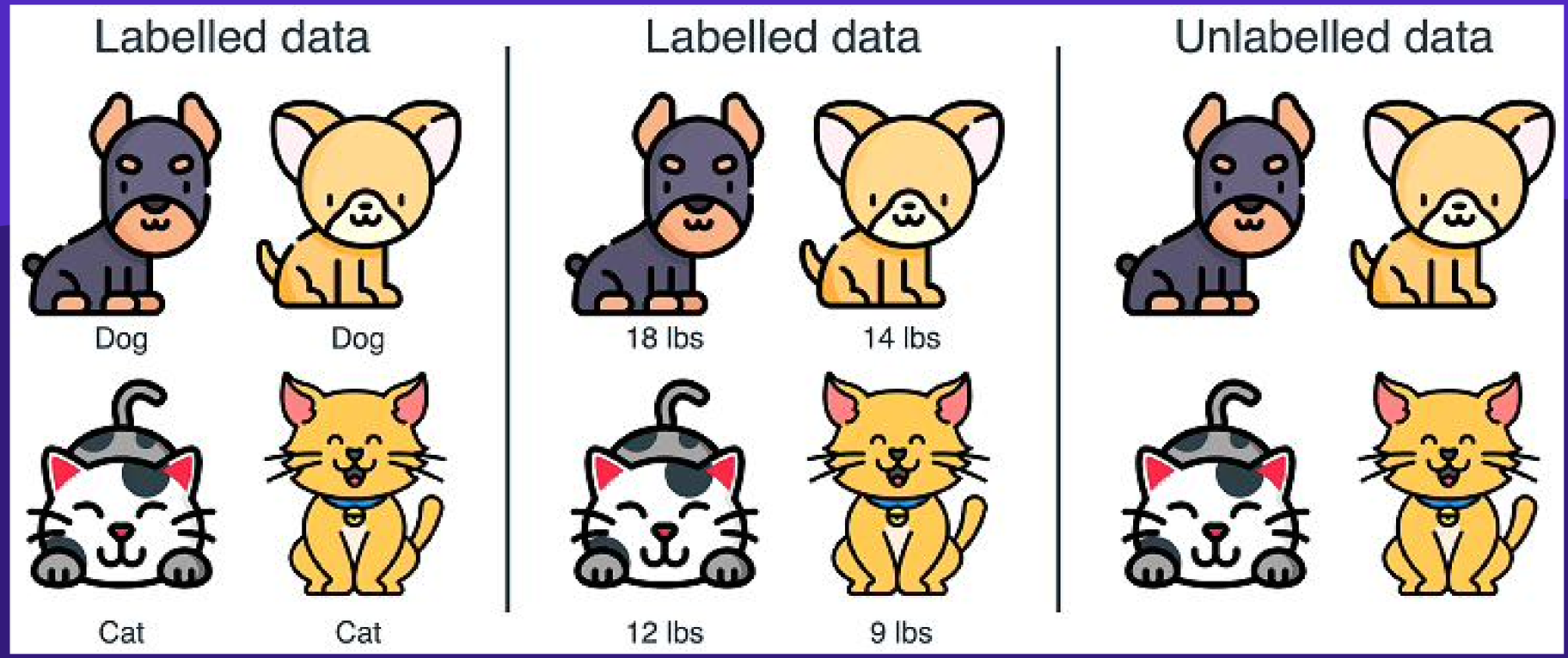
Small recap

Types of learning



Small recap

Types of data

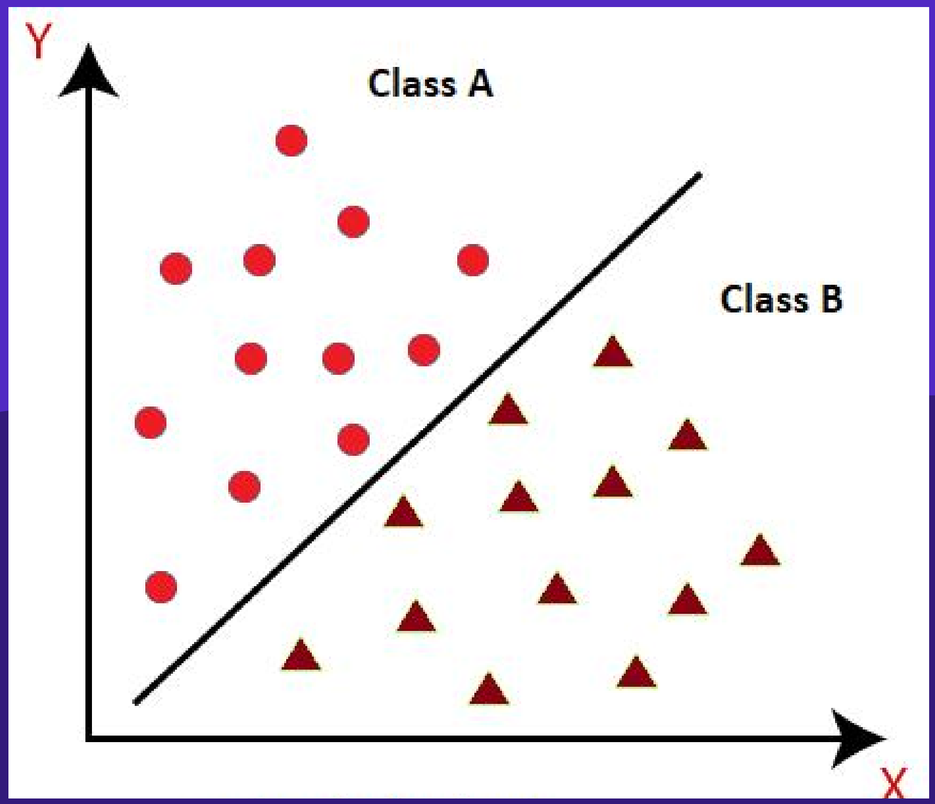


What is

Classification?

Classification is the process of predicting the category or label of a given input based on its features.

It’s like sorting items into different groups, such as determining whether an email is spam or not.

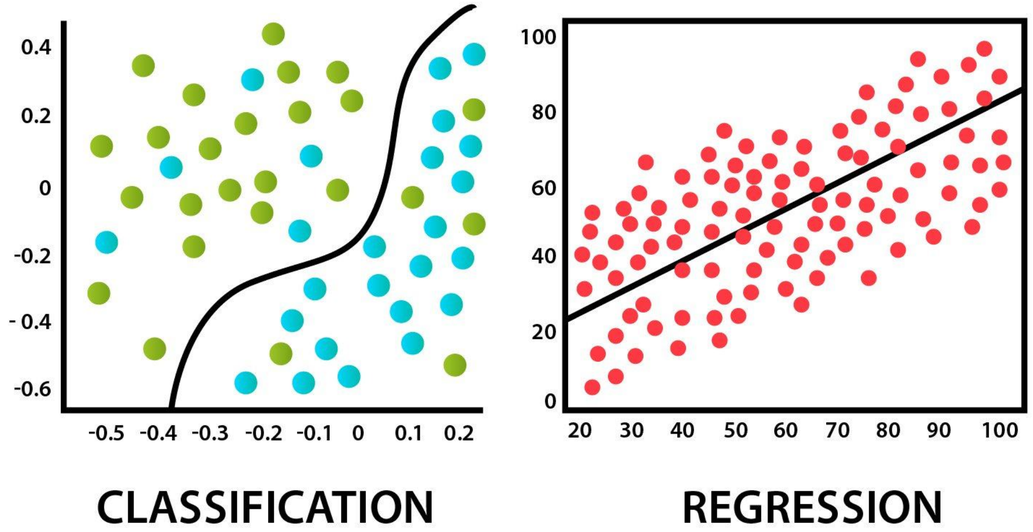


What is

Classification?

Classification and Regression are the same.

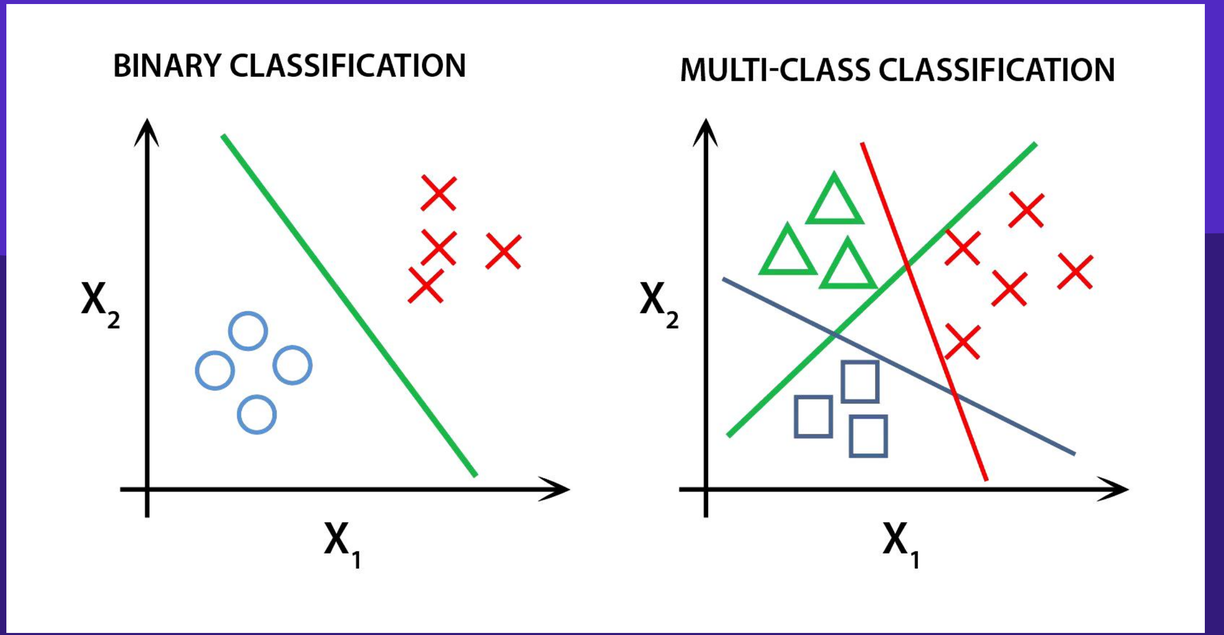
The difference is that in classification, the categorical Y variable is comprised of classes, whereas in regression, the Y variable is a continuous numerical variable.



Types of

Classification

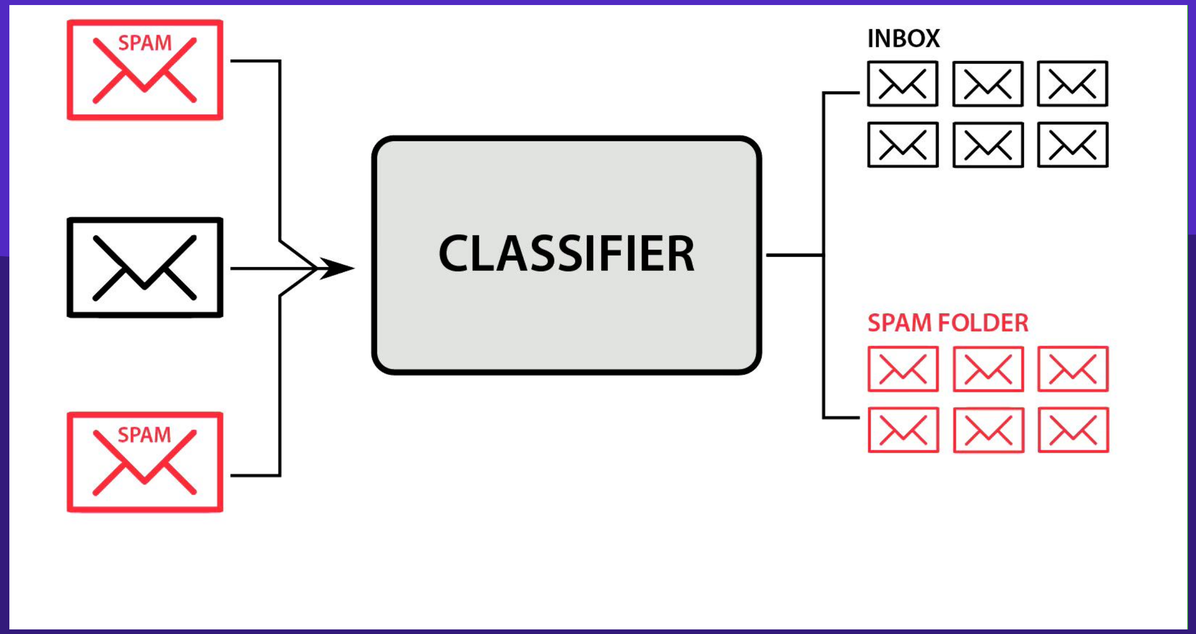
lg it’s self explanatory..



Types of

Classification

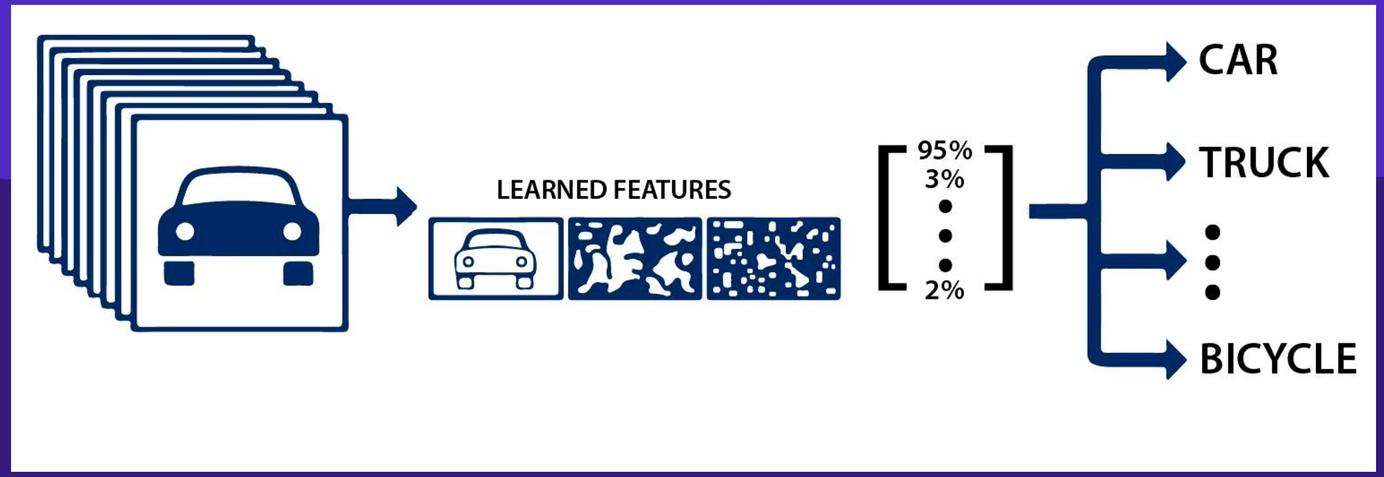
Binary Classification



Types of

Classification

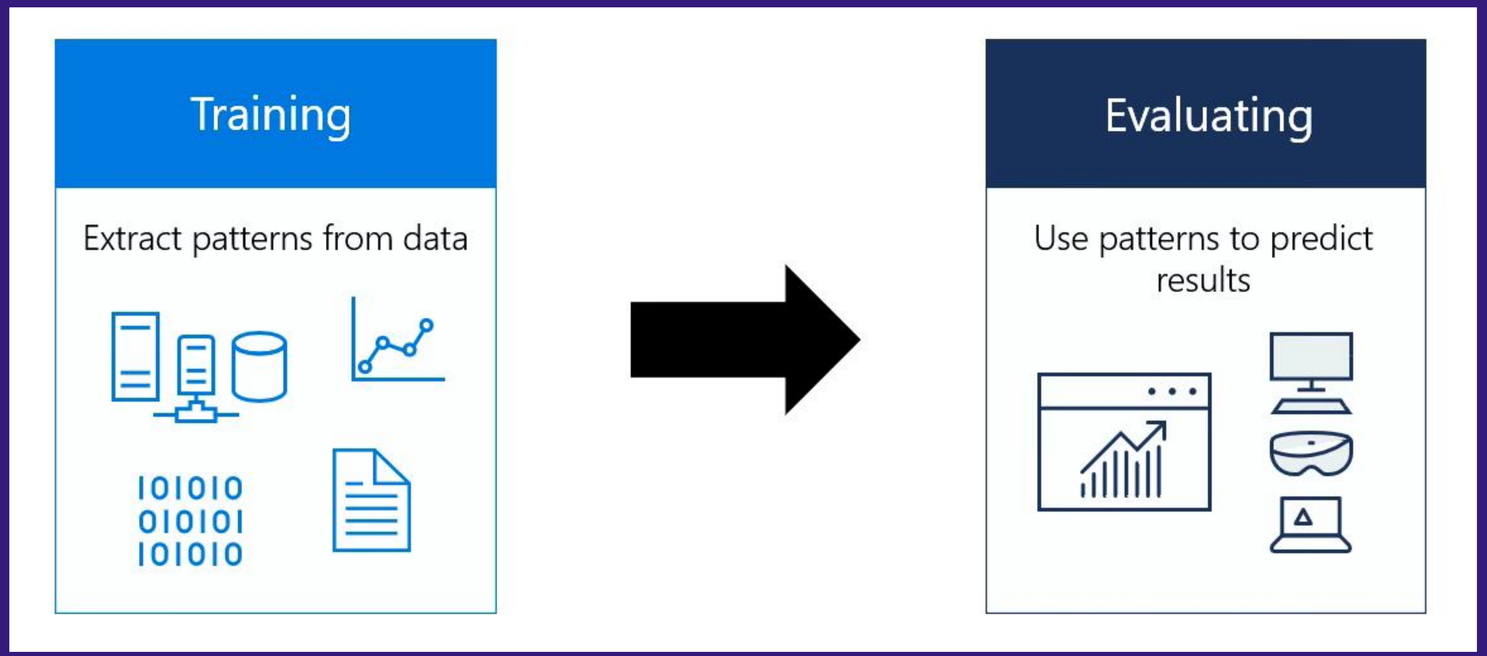
Multi-Class Classification



Steps of

Classification?

1. Learning Step (Training Phase)
2. Classification Step



THE
Algorithms

Logistic regression

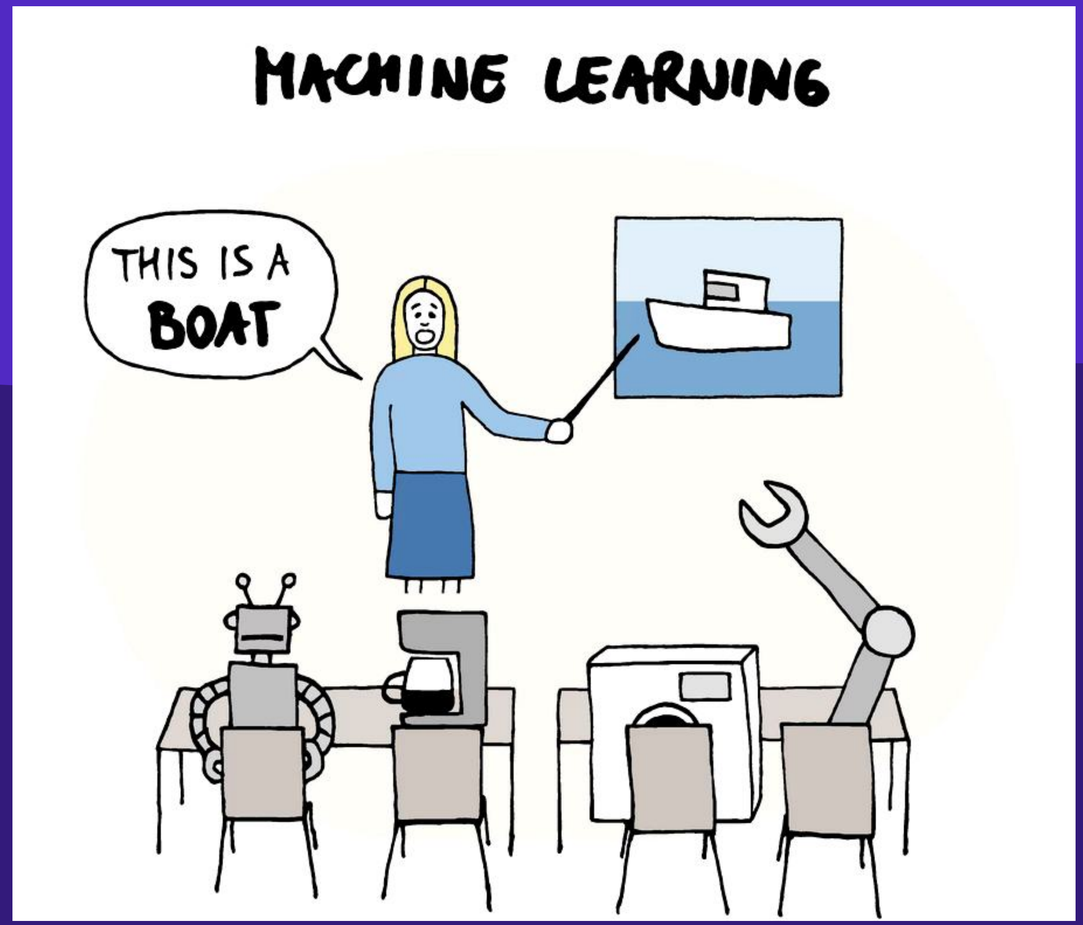
K-Nearest Neighbors (KNN)

Naive Bayes

Decision Trees

Random Forest

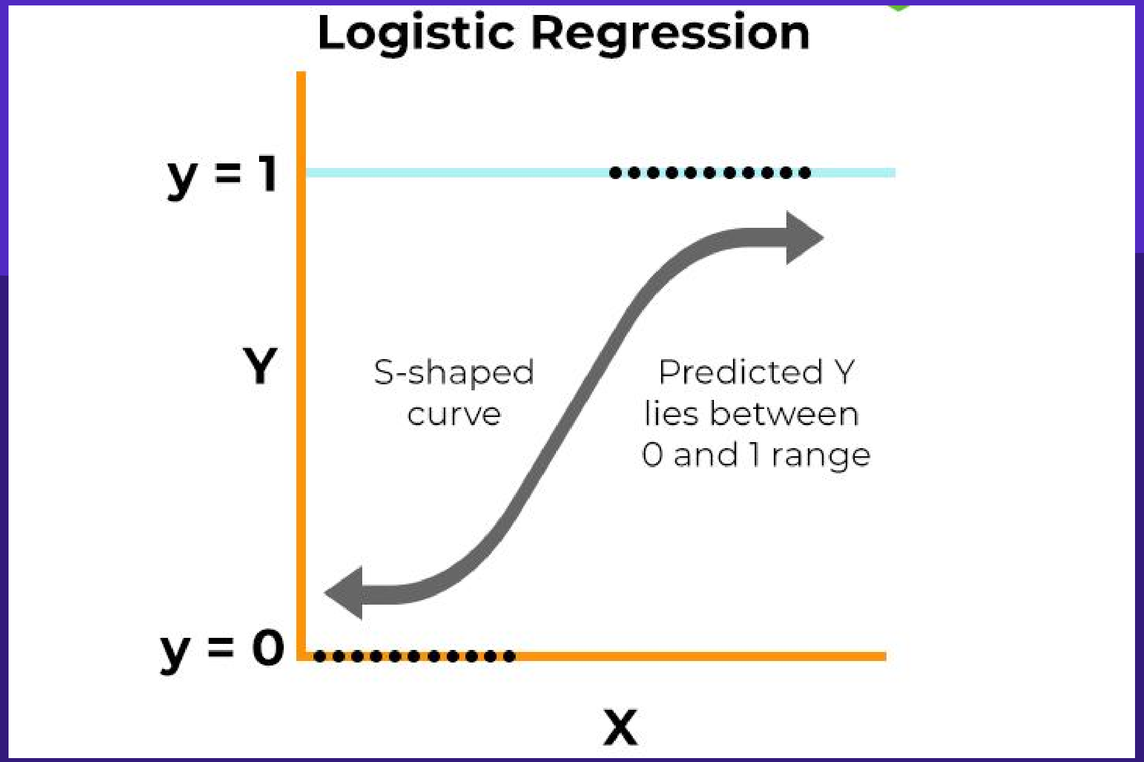
Support Vector Machine (SVM)



What is

Logistic regression?

Logistic regression is used to predict the likelihood that an input belongs to one of two categories.

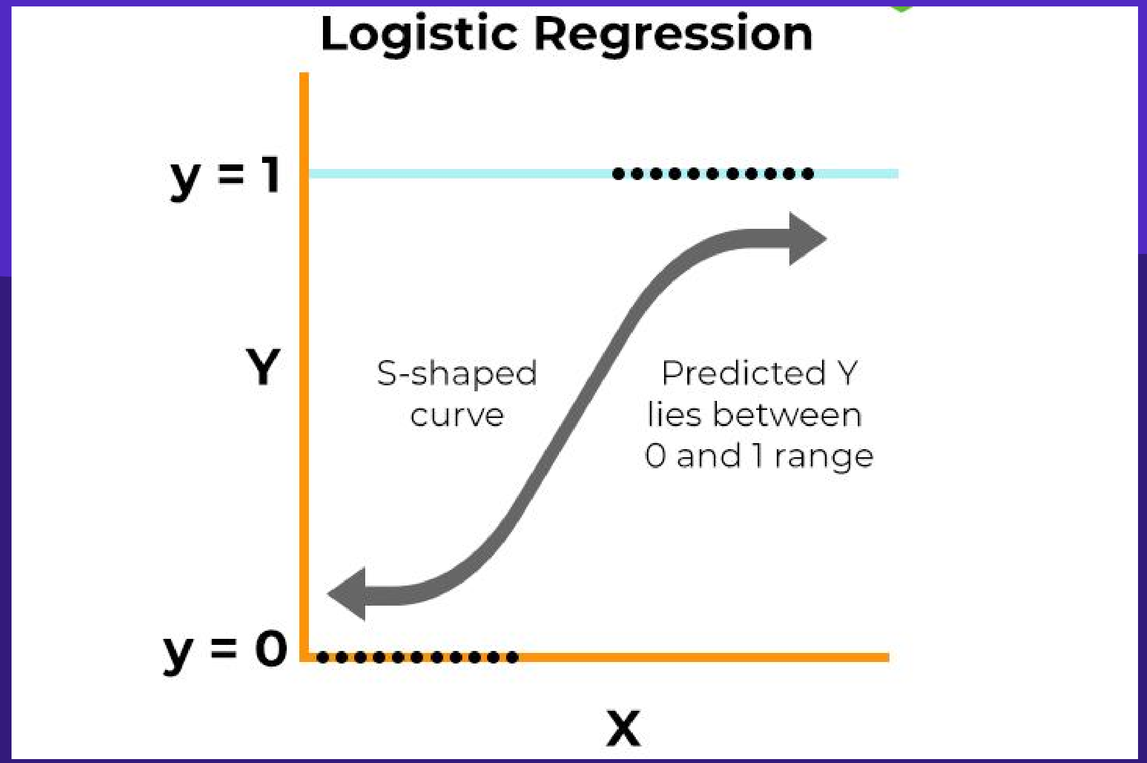


What is

Logistic regression?

It does this by calculating a probability, using a special function (the sigmoid function),

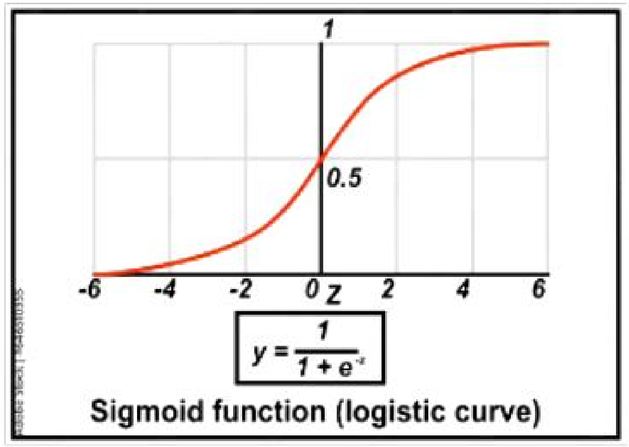
which maps any input to a value between 0 and 1.



What is

Logistic regression?

If the probability is greater than a certain threshold (usually 0.5),
the model predicts one class, otherwise,
it predicts the other.



Domain: $(-\infty, \infty)$

Range: $(0, +1)$

Formula: $y(x) = \frac{1}{1+e^{x}}$

Derivation:

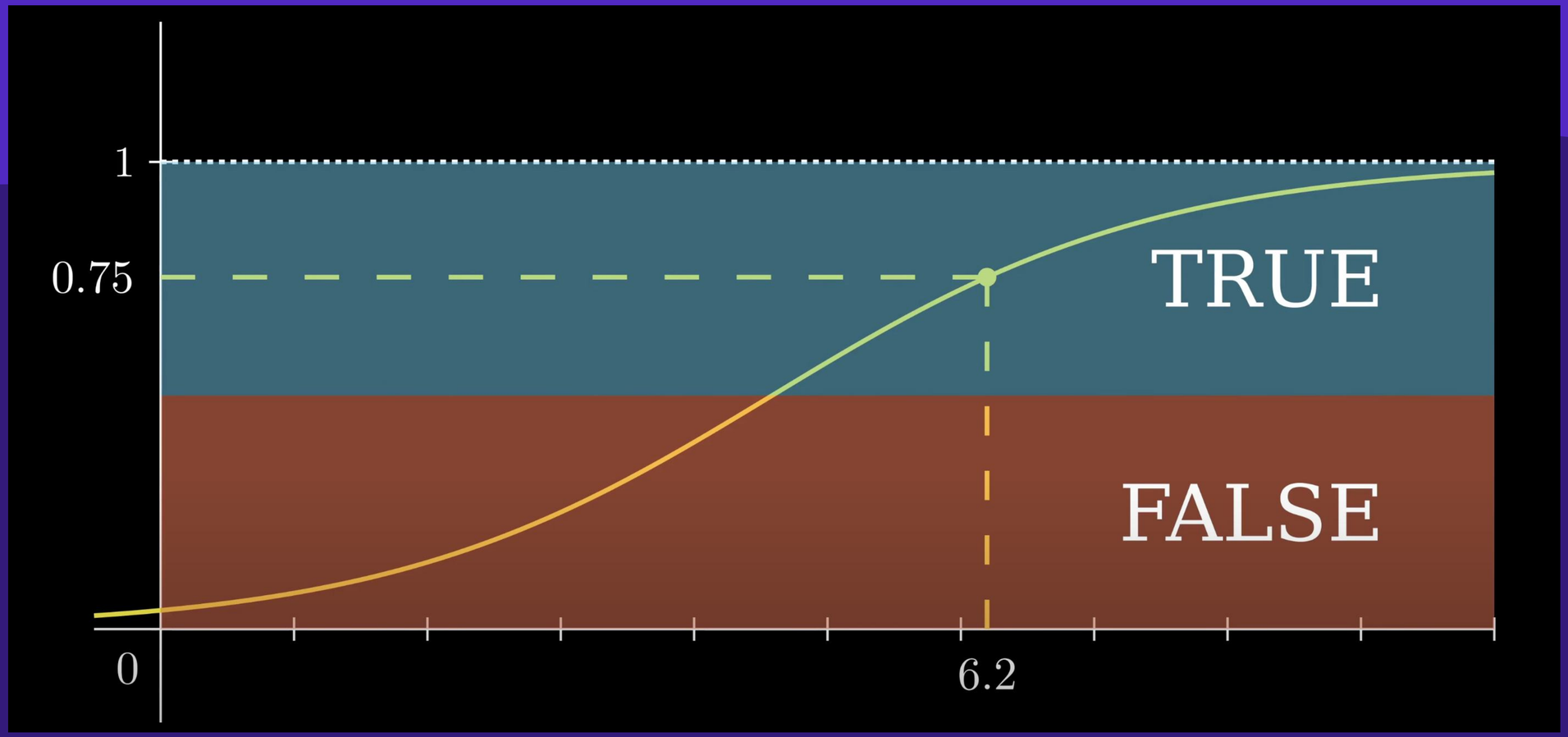
$y'(x) = y(x)(1-y(x))$

$y(0) = 0.5$

What is

Logistic regression?

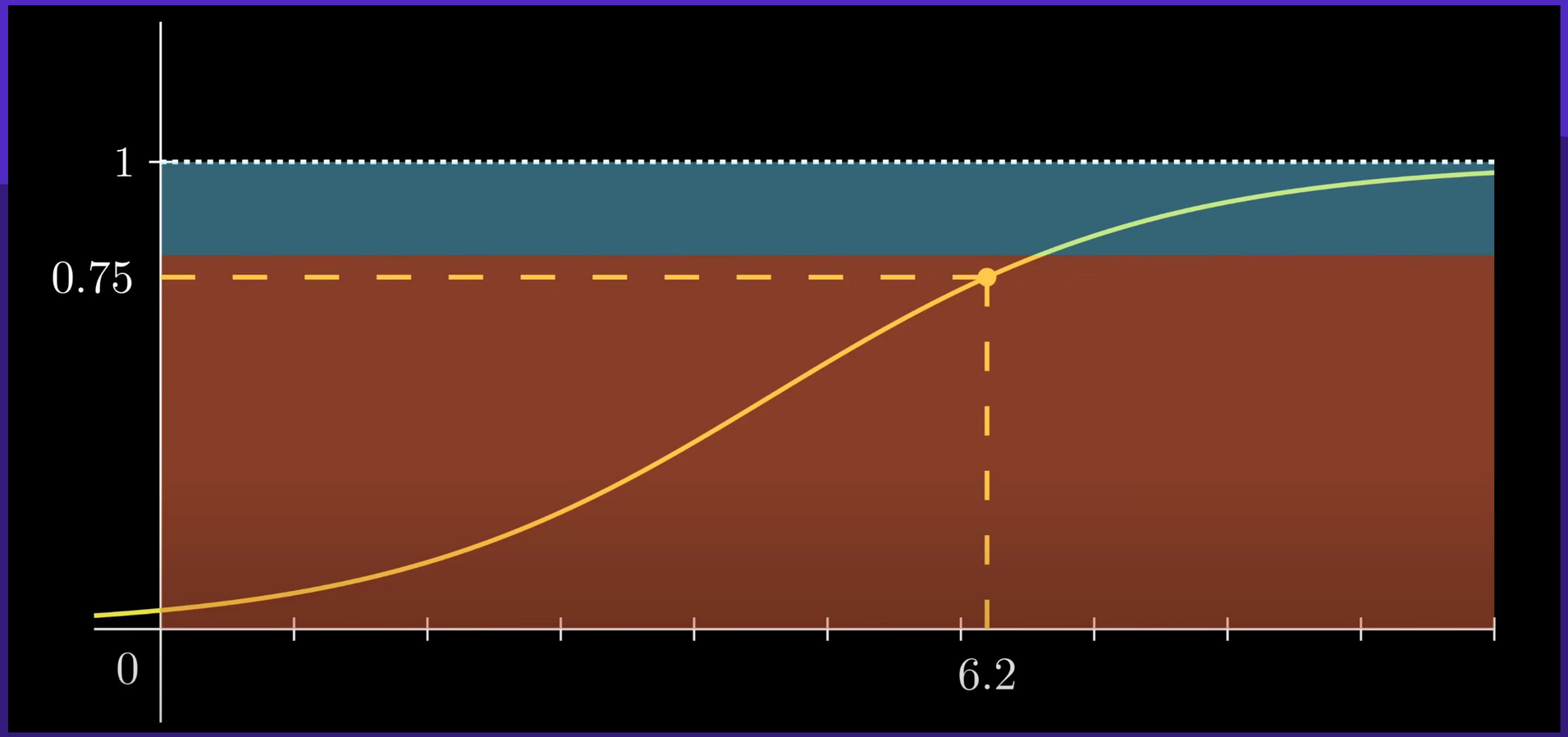
How does it do that?



What is

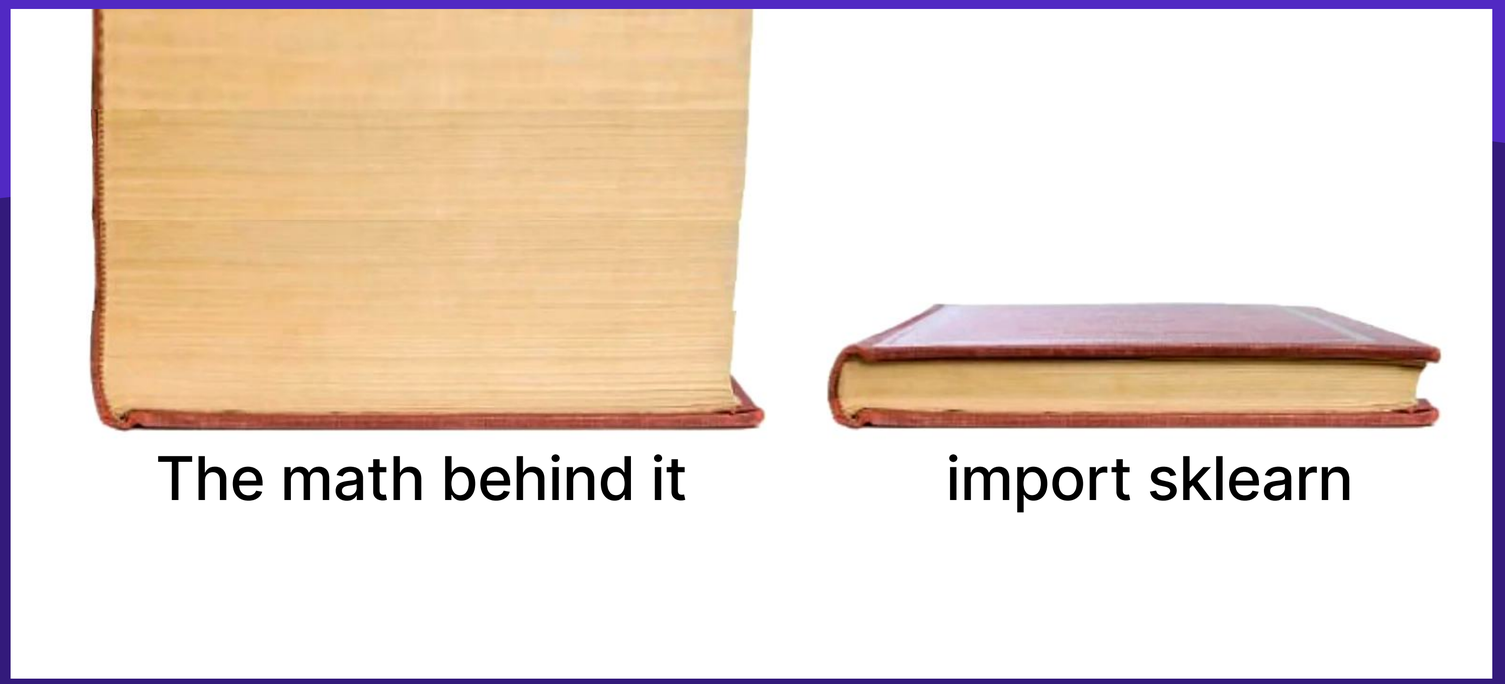
Logistic regression?

The threshold



Let’s

CODE

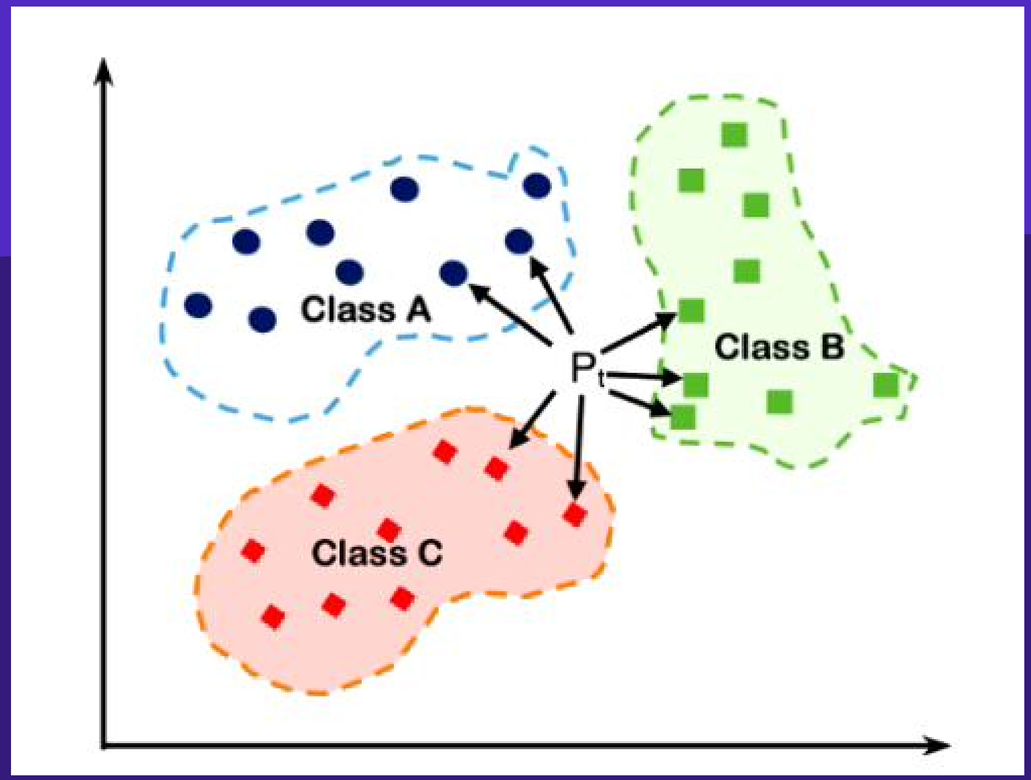


What is

K-Nearest Neighbors

KNN is a simple algorithm that classifies something by looking at its closest ‘neighbors.’

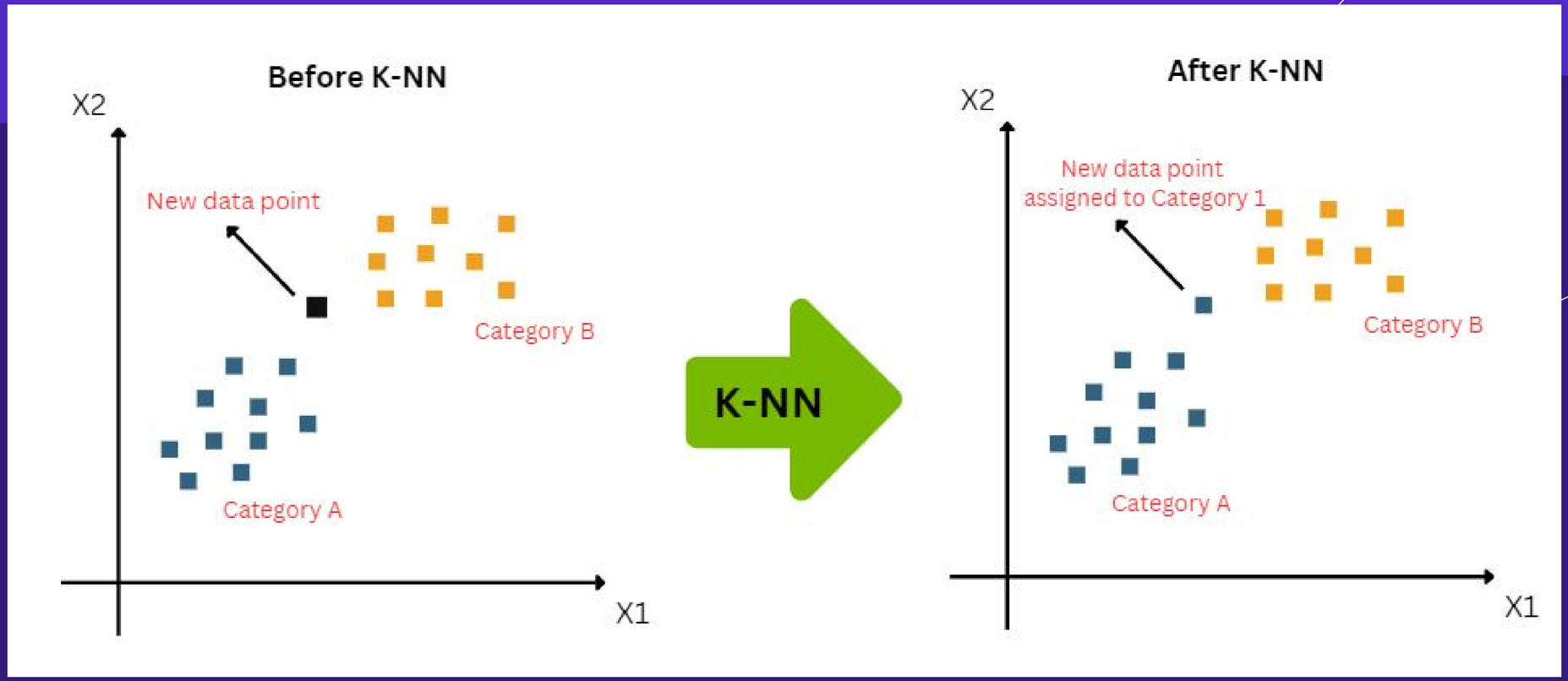
It checks the data points closest to it (based on distance),
and whatever most of the nearby points belong to,
it assigns that category.



What is

K-Nearest Neighbors

How it works?



Let’s

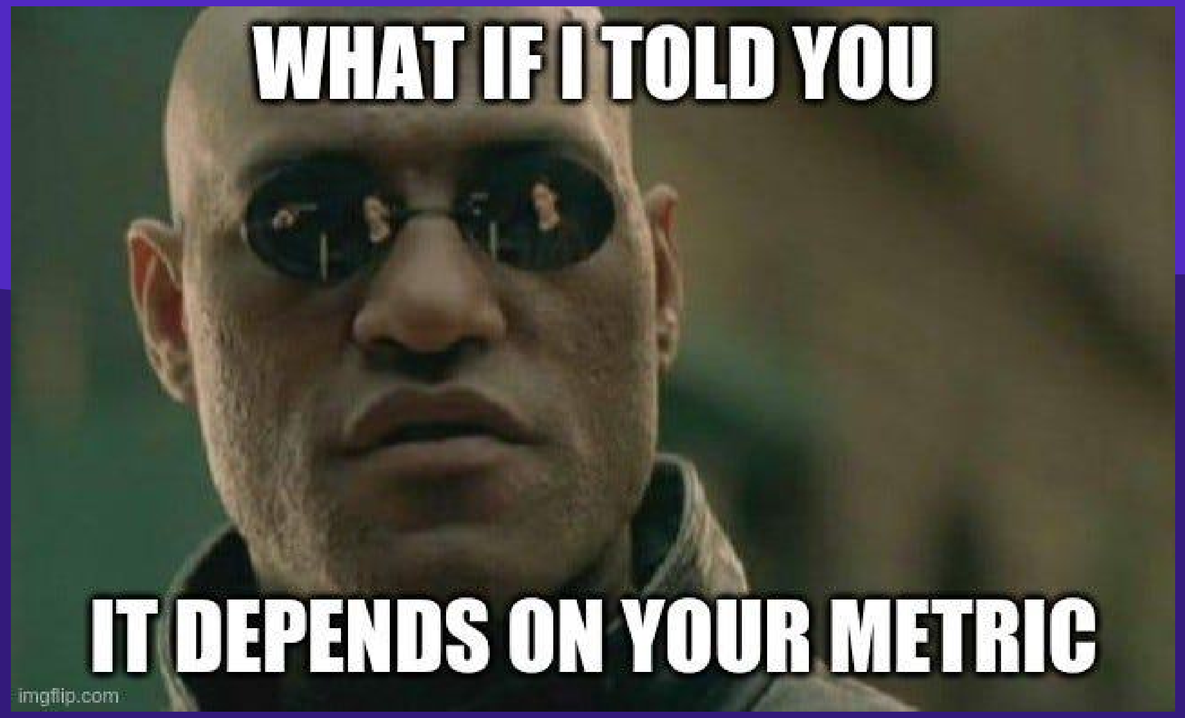
CODE


Math behind Deep Learning
@debo
I'M NOT VERY GOOD AT IT.
from keras.models import Model
BUT IT DOESN'T MATTER.

Intro to

Metrics

Is my model good ?



Intro to **Metrics**

Let’s start with an example

A bit of context

Imagine you are a healthcare startup, and want an AI assistant able to predict whether a given patient has a heart disease or not based on its health record. This is a binary classification problem where the model will predict

- 1, True or Yes if the patient has heart disease
- 0, False or No otherwise

Intro to

Metrics

1 Confusion matrix

A 2X2 matrix that nicely summarizes the number of correct predictions of the model. It also helps in computing different other performance metrics.

Predicti / Reality	Yes	No
Yes	True Positives (TP)	False Negatives (FN)
No	False Positives(FP)	True Negatives (TN)

Type I Error

Type II Error

Type I & II Errors can be used interchangeably when referring to False Positives and False negatives respectively

Intro to

Metrics

2 Accuracy

We get *accuracy* by answering this question: **"out of the predictions made by the model, what percentage is correct?"**

$$Accuracy = \frac{TP + TN}{Total\ number\ observation}$$

Intro to

Metrics

3 Precision

We get *precision* by answering this question: **"out of all the YES predictions, how many of them were correct?"**

$$Precision = \frac{TP}{TP + FP}$$

Intro to

Metrics

4 Recall / Sensitivity

It aims to answer this question: **"how good was the model at predicting real Yes events?"**, which can be considered as the flip of the precision.

$$Sensitivity = \frac{TP}{TP + FN}$$

Intro to

Metrics

5 Recall / Specificity

It aims to answer this question: **"how good was the model at predicting real No events?".**

$$Specificity = \frac{TN}{TN + FP}$$

Intro to

Metrics

6 F1 Score

Sometimes used when dealing with imbalanced data set, meaning that there are more of one class/label than there are of the other. It corresponds to the harmonic mean of the precision and recall.

$$F1\ Score = 2 . \frac{Precision \times Recall}{Precision + Recall}$$

Thank you

If you have any questions تفَضَّلو

Practical example