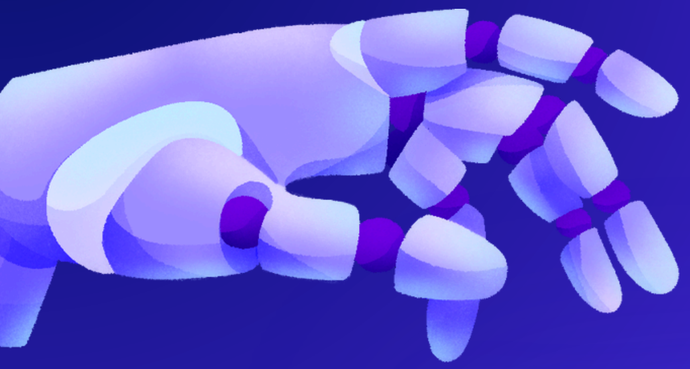
AI/MACHINE LEARNING WORKSHOP

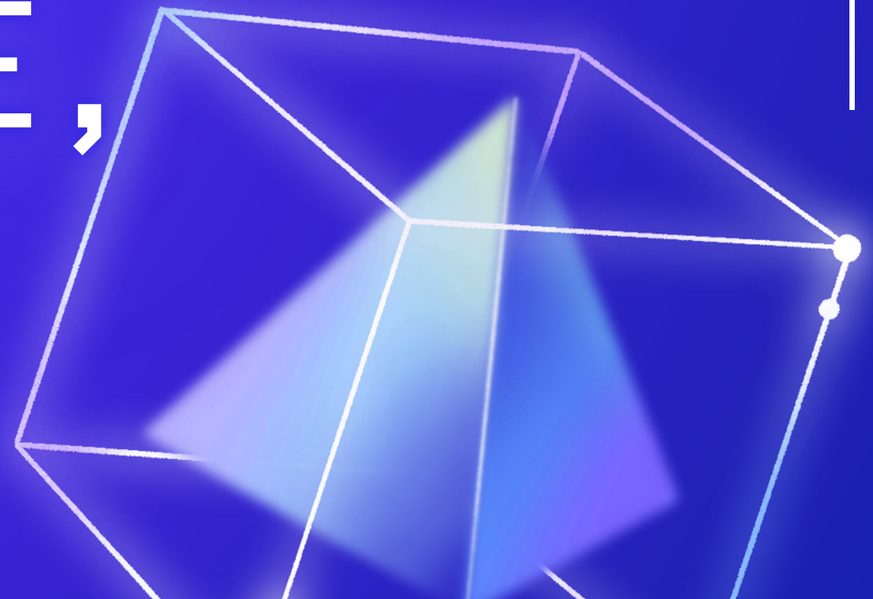
DAY 1: INTRODUCTION TO AI & ML: CONCEPTS & REAL-WORLD APPLICATIONS

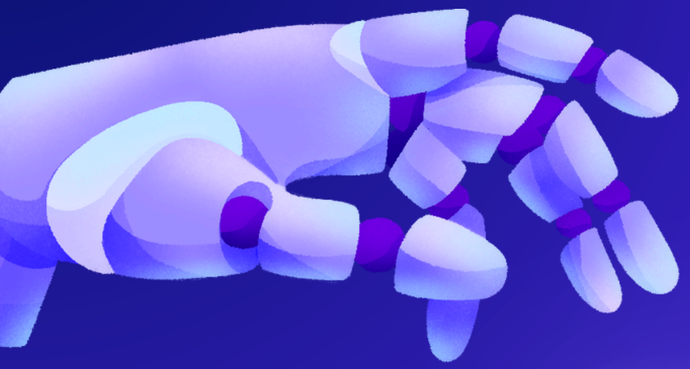
Youth Oppurtunties in Tech Inovation



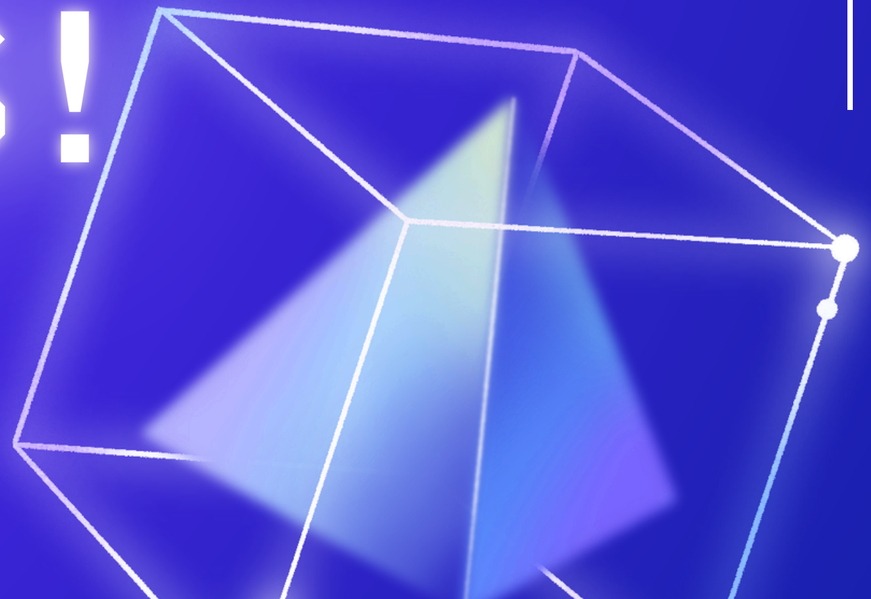
INTRODUCTIONS

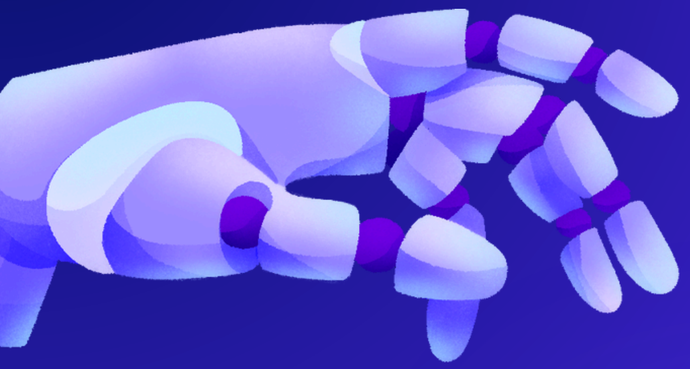
NAME, GRADE, STATE



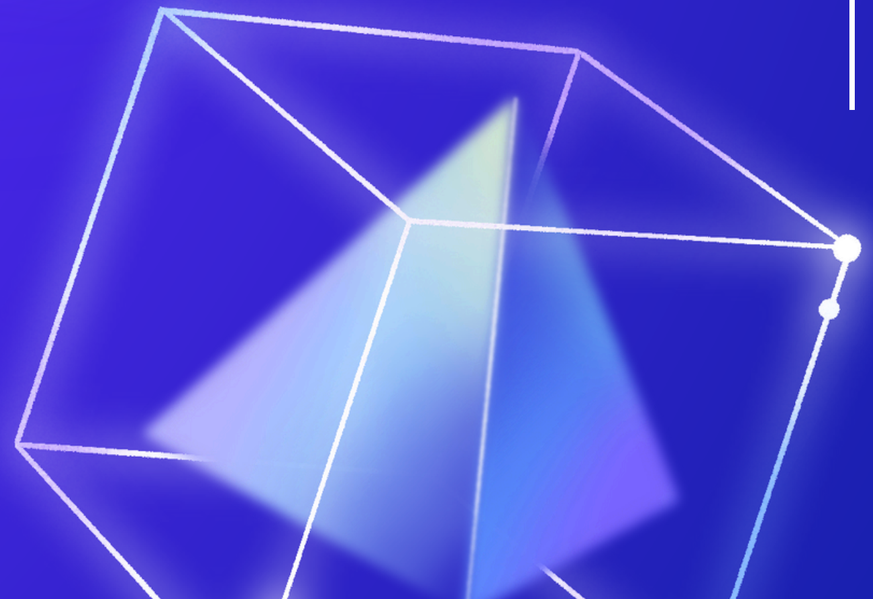


PLEASE ASK QUESTIONS!

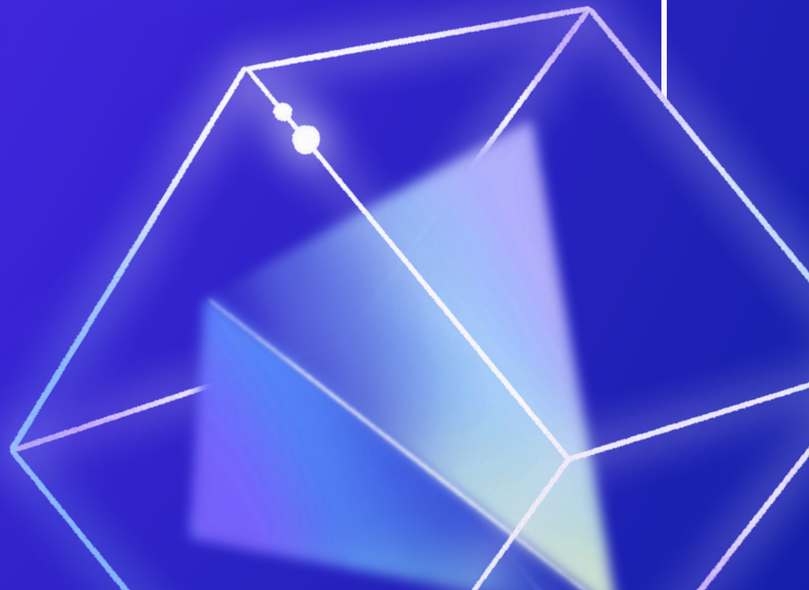




WHAT IS AI

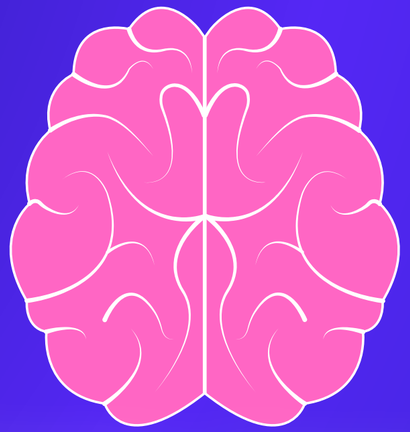


WHAT IS MACHINE LEARNING

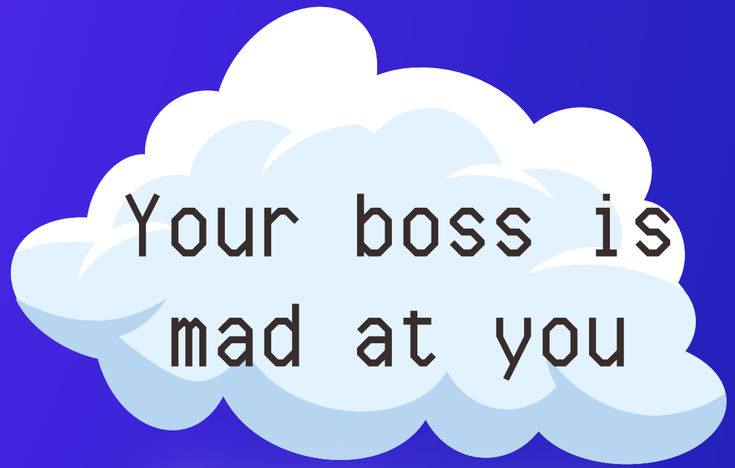


Lets look at an example...

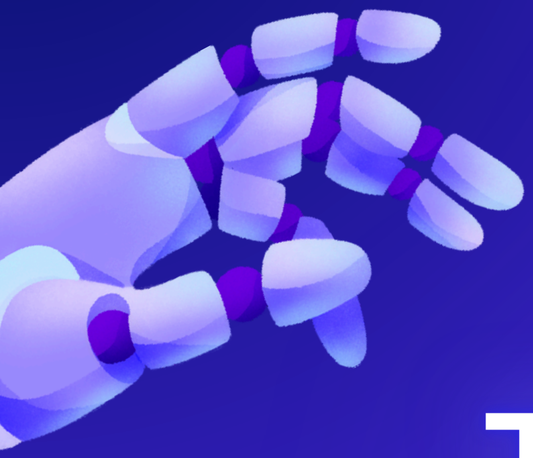
Input Data



Model (your brain)



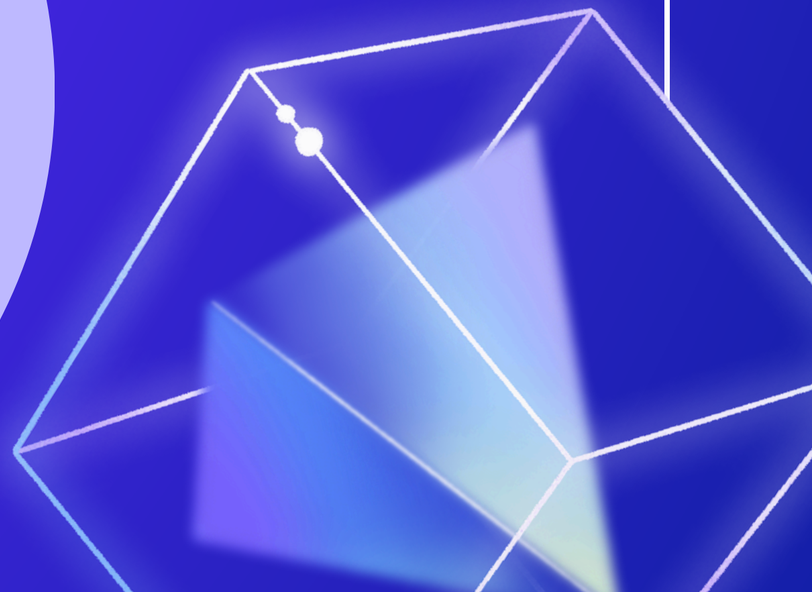
Prediction



ACTIVITY: THINK OF SOME OTHER EXAMPLES

MACHINE LEARNING IS A TYPE OF ARTIFICIAL INTELLIGENCE (AI) THAT ALLOWS COMPUTERS TO LEARN FROM DATA AND MAKE DECISIONS OR PREDICTIONS WITHOUT BEING EXPLICITLY PROGRAMMED.

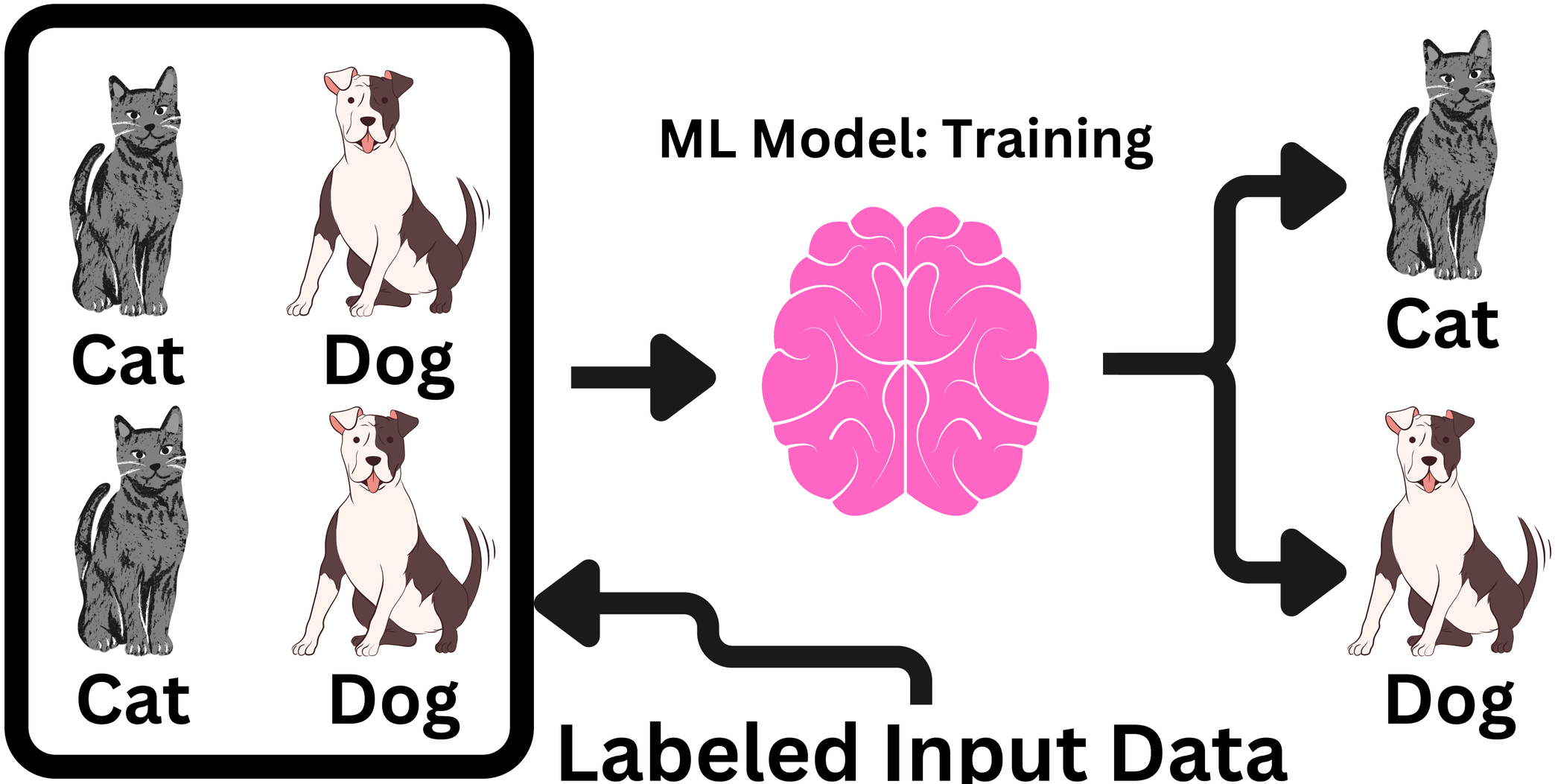
Deep Reinforcement Learning



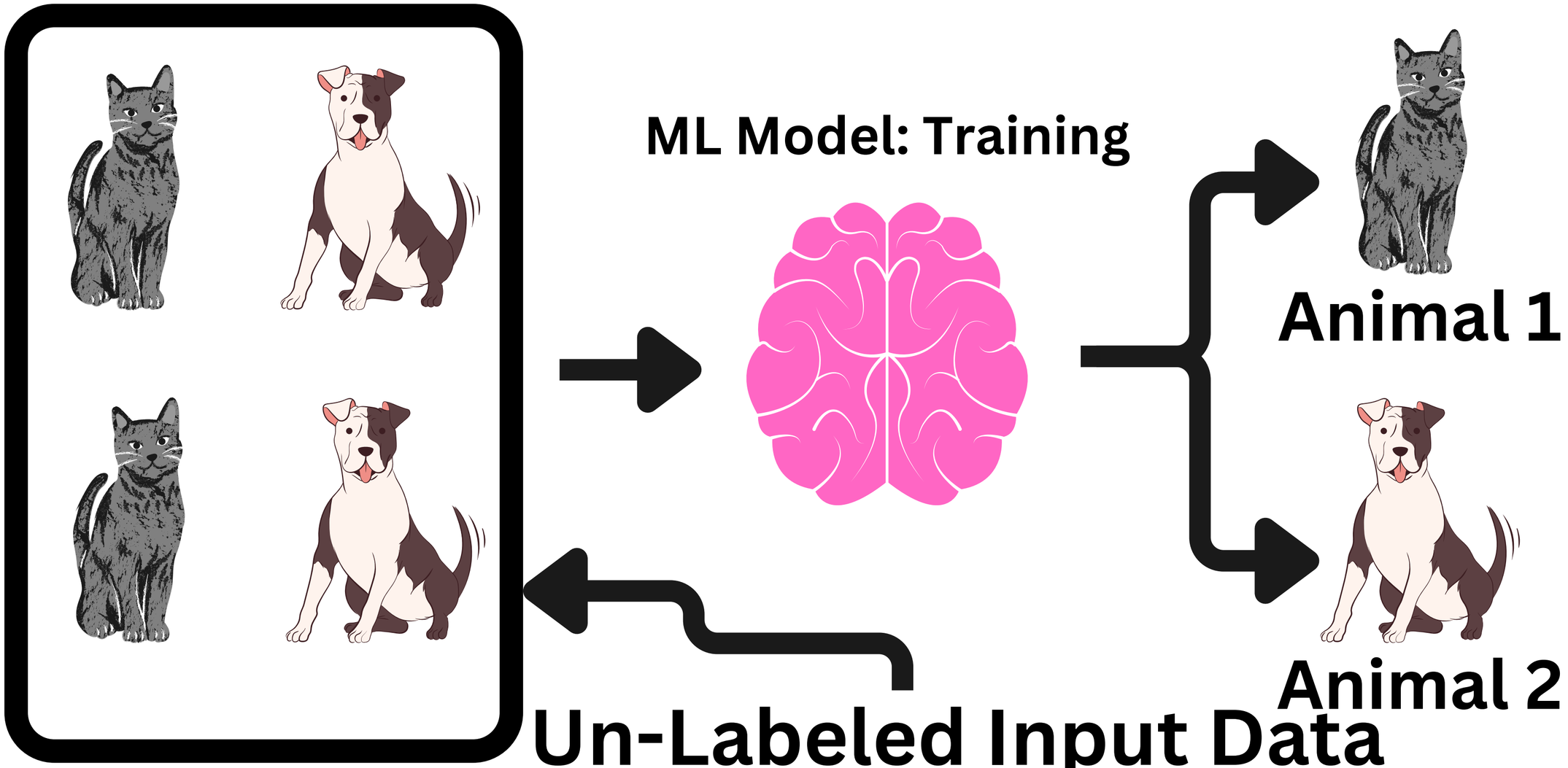
Instead of hours of code

Learn and adapt from data

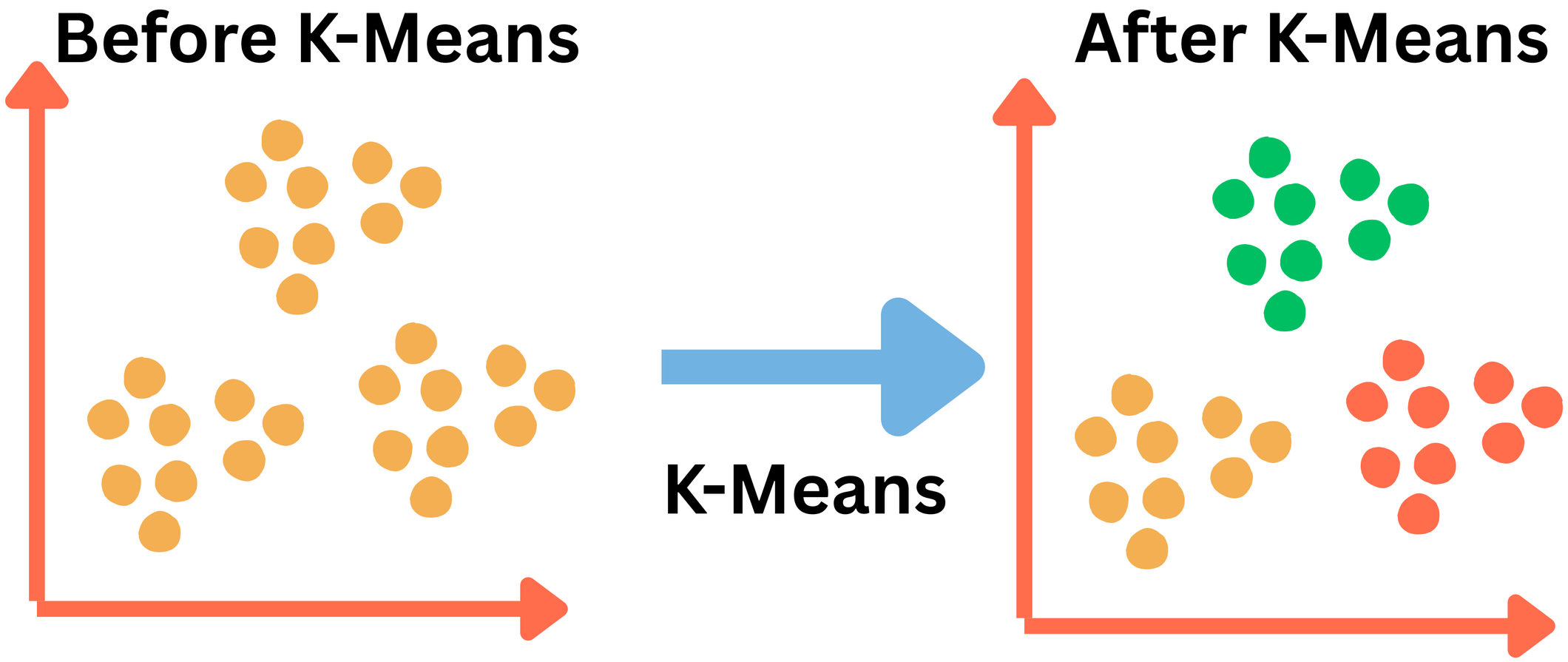
Supervised Learning



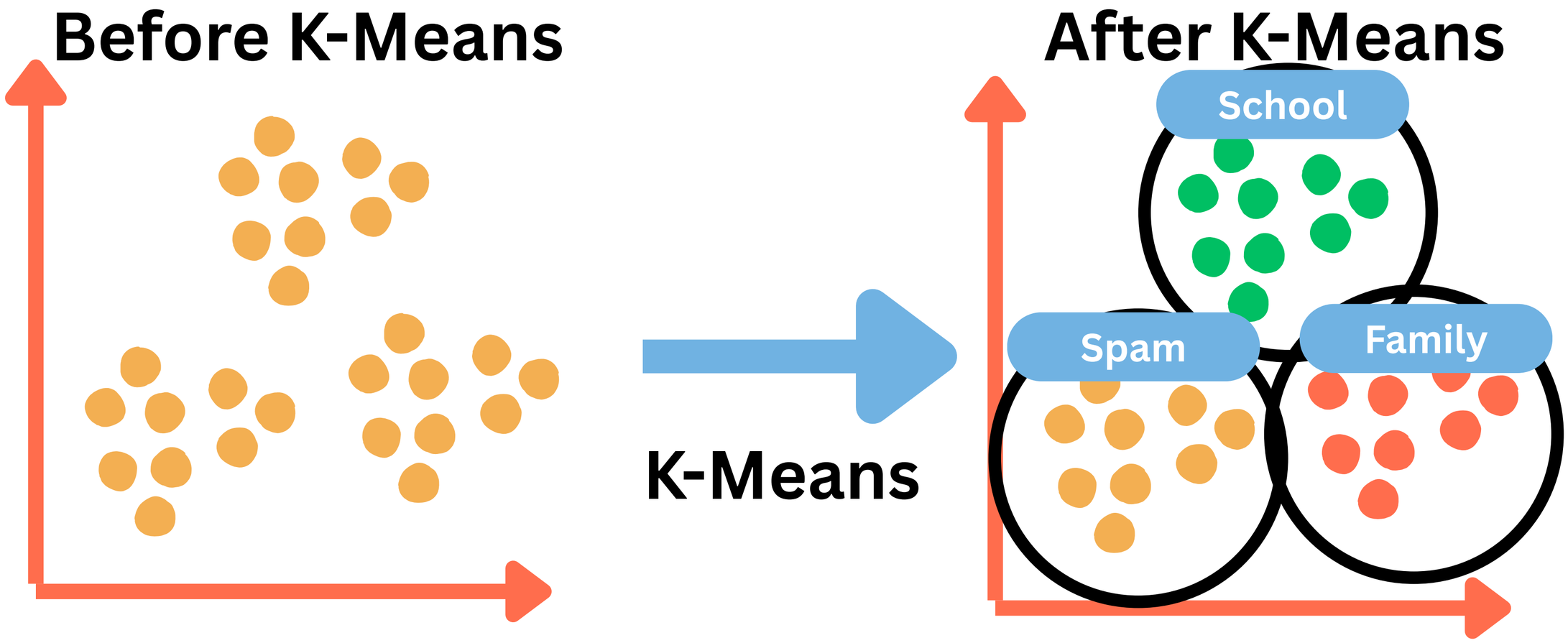
Un-Supervised Learning



Un-supervised Learning



Un-supervised Learning



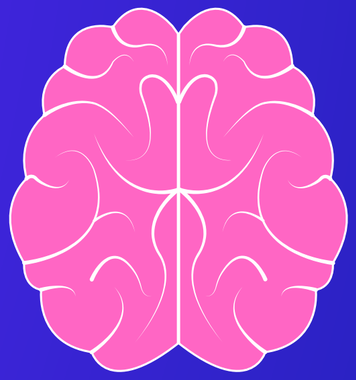
1. MACHINE LEARNING

Training (Stage 1)

Patient Id Patient ID	Age Age of Patient	Gender Gender of Patient	Air Pollution Air pollution that each patient is exposed to	Alcohol use Alcohol use of Patient
1000 unique values	43.50 - 49.40 Count: 186 14 73	1.00 - 1.10 Count: 590 1 2	1.70 - 2.40 Count: 204 1 8	1 8
P1	33	1	2	4
P10	17	1	3	1
P100	35	1	4	5
P1000	37	1	7	7
P101	46	1	6	8
P102	35	1	4	5
P103	52	2	2	4

Input Data

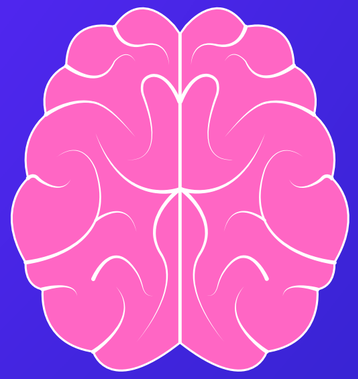
Learning Algorithim



ML Model

Inference (Stage 2)

New Data



ML Model

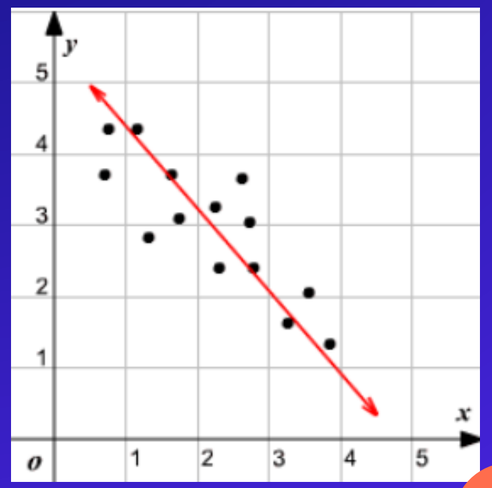
Prediction

LINEAR REGRESSION:

MACHINE LEARNING LINEAR REGRESSION FINDS THE BEST-FITTING STRAIGHT LINE THROUGH DATA POINTS TO PREDICT A CONTINUOUS OUTCOME BASED ON INPUT VARIABLES.

Inference (Stage 2)

Making predictions with a model

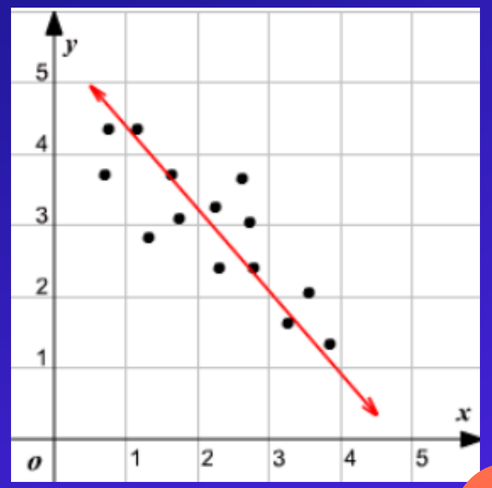


$$\hat{y} = wx + b$$

- ŷ = Carbon Emissions next week
- x = Todays Carbon Emissions
- (w,b) = Model Parameters

Inference (Stage 2)

Making predictions with a model



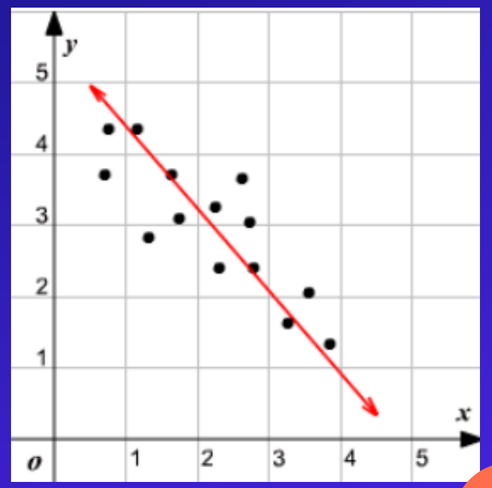
Input

$$\hat{y} = wx + b$$

- $\hat{y}$ = Carbon Emissions next week
- x = Todays Carbon Emissions
- (w,b) = Model Parameters

Inference (Stage 2)

Making predictions with a model



Prediction

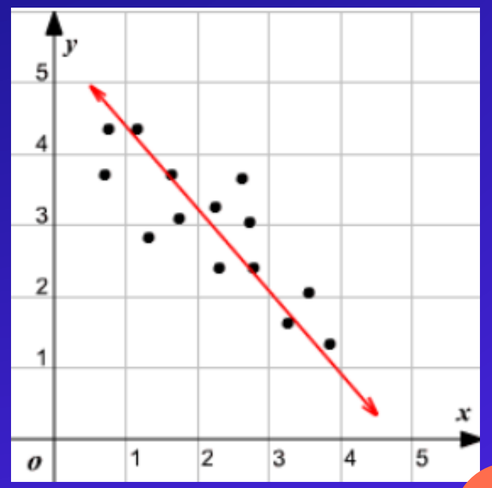
Input

$$\hat{y} = wx + b$$

- ŷ = Carbon Emissions next week
- x = Todays Carbon Emissions
- (w,b) = Model Parameters

Inference (Stage 2)

Making predictions with a model



Prediction

Input

Paramaters

$$\hat{y} = wx + b$$

- ŷ = Carbon Emissions next week
- x = Todays Carbon Emissions
- (w,b) = Model Parameters

Training (Stage 1)

Fit the Models prediction to True Value

Loss Function: Goal to get smallest loss

$$\text{MSE} = \frac{1}{N}\sum_{i-1}^{N}(y_i - \hat{y}_i)^2$$

Mean Square Error

N = Number of training examples

y_i = Actual value

$\hat{y}_i$ = Predicted value for the i^{th} example

Training (Stage 1)

Fit the Models prediction to True Value

Loss Function: Goal to get smallest loss

Paramaters: We adjust to minimize the loss and get close to true value

$$\text{MSE} = \frac{1}{N}\sum_{i=1}^{N}(y_i - (wx_i + b))^2$$

Mean Square Error

N = Number of training examples

y_i = Actual value

$\hat{y}_i$ = Predicted value for the i^{th} example

HOW DO WE KNOW WHAT OUR PARAMETERS ARE

Training (Stage 1)
Fit the Models prediction to True Value

Optimization Algorithim: Gradient Descent to adjust w and b

$$w = w - \alpha \frac{\partial \text{MSE}}{\partial w}$$

$$b = b - \alpha \frac{\partial \text{MSE}}{\partial b}$$

- α = Learning rate (controls step size)
- $\frac{\partial \text{MSE}}{\partial w}$ and $\frac{\partial \text{MSE}}{\partial b}$ are the gradients (slopes) of the loss function with respect to each parameter

We keep updating w and b until the error is minimized (or we reach a set number of iterations).

QUESTIONS?

ACTIVITY: SETTING UP JUPYTER LAB

ACTIVITY: BUILDING LINEAR REGRESSION MODEL

QUESTIONS AND FINAL THOUGHTS!

THANK YOU!