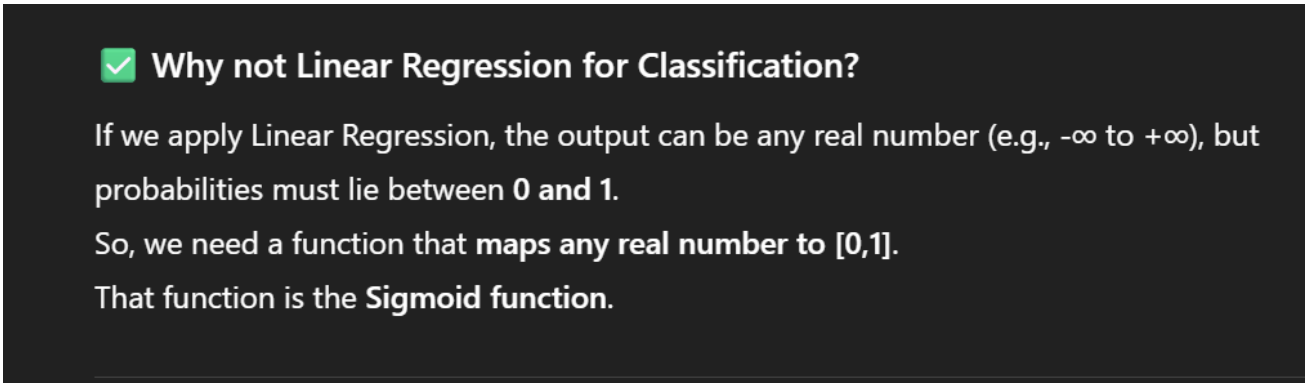
Logistic Regression:-

Logistic Regression is a **classification algorithm** used when the target variable is **categorical** (Yes/No, Spam/Not Spam, 0/1).



Why is Logistic Regression called 'Regression' if it is used for classification?

- Because it uses a linear equation like Linear Regression ($z=w0+w1x1+...z = w\_0 + w\_1x\_1 + ...z=w0+w1x1+...$) inside, but then applies Sigmoid to convert it to probability.
- The name comes from the underlying regression equation.

What is the decision boundary in Logistic Regression?

- A **threshold** that separates the classes.
- Usually, we use **0.5**:
  - If probability $\geq 0.5 \rightarrow$ Class 1
  - If probability $< 0.5 \rightarrow$ Class 0
- In terms of zzz, the decision boundary is where $z=0z = 0z=0$.

Why do we use the Sigmoid function in Logistic Regression?

- Because the output of the linear equation z=w0+w1x1+...z = w_0 + w_1x_1 + ...z=w0+w1x1+... can be **any real number**.
- We need probabilities between **0 and 1**, so we apply the **Sigmoid function**:

σ(z)=11+e−z\sigma(z) = \frac{1}{1 + e^{-z}}σ(z)=1+e−z1

This squeezes values into [0, 1].

Why can't we use Mean Squared Error (MSE) as the cost function in Logistic Regression?

- MSE assumes **linear relationship**, but Logistic Regression is **non-linear** because of Sigmoid.
- Using MSE can make the gradient descent very slow and may not converge.
- So, we use **Log Loss**, which works better for probabilities.

What is the cost function used in Logistic Regression? Explain it.

- Log Loss (Binary Cross-Entropy):

How do you handle multicollinearity in Logistic Regression?

- Multicollinearity = when features are highly correlated.
  Solutions:
- Remove correlated features.
- Use **Principal Component Analysis (PCA)**.
- Apply **regularization (L1 or L2)**.