**Linear Classification**

**Regression vs classification:** Regression gives continuous values (number) whereas classification gives discrete values (labels).

**Linear Regression:**

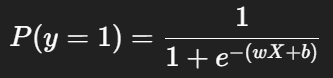
* **Type**: Regression
* **Output**: Continuous number (e.g., 45.7, 100.3)
* **Equation**:

y=wX+b

* **Use case**: Predict house prices, salaries, temperatures.

**Logistic Regression:**

* **Type**: Classification
* **Output**: Probability (between 0 and 1), then mapped to a class (0/1).
* **Equation**:



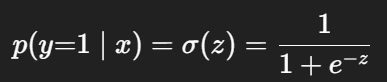
* **Use case**: Spam vs not spam, disease vs no disease, buy insurance vs not buy.

**Logistic Regression Theory**

**Logistic Regression:**

* Logistic Regression is a **linear classifier** that predicts the **probability** of class 1 (e.g., spam) given features x.
* It computes a linear score *z=w^t\*x + b* and then **squashes** that score into *[0,1][0,1]*[0,1] with the **sigmoid**.
* Decision: choose a threshold (usually 0.5) to convert probability → class label.

**Formula:**



**Why Logistic Regression:**

* Linear Regression isn’t suitable for classification (can predict values <0 or >1).
* Logistic regression fixes this using the sigmoid function to bound output in [0,1].