Regression vs Classification Problems

Regression

Predict continuous values

Examples:
Price, Temperature, Age

VS

Classification

Predict discrete categories

Examples:
Spam/Ham, Disease/Healthy

Key Difference:

Output Space: $\mathbb{R}$ (continuous) vs. Finite Set (discrete)

Regression Output

$$y \in \mathbb{R}$$

Scalar/Vector: $\hat{y}$ = 25.7°C
Multi-output: $\hat{y}$ = [150.2, 175.8, 163.4] kg

Classification Output

$$y \in \{0, 1, ..., K\text{-}1\}$$

Binary: $\hat{y}$ = 1 (Spam), $\hat{y}$ = 0 (Ham)
Multi-class: $\hat{y}$ = 2 (Cat), or $\hat{y}$ = [0, 0, 1, 0]

Why linear regression fails:
Predictions outside [0,1] range

Need for probability:
P(y=1|x) interpretation

Today's Focus:

Binary Classification (Two Classes)