

# Logistic Regression

Prof. Alessandro Lucantonio

Aarhus University - Department of Mechanical and Production Engineering

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# Binary classification

Classification : discrete target (output vector).

Binary classification:  $\{0, 1\}$  target

Example of binary classification task: Spam/not spam emails.

Idea: consider hypothesis  $h_{\mathbf{w}}$  such that

$$0 \leq h_{\mathbf{w}} \leq 1.$$

- ▶ if  $h_{\mathbf{w}}(\mathbf{x}) \geq 0.5$ , predict 1;
- ▶ if  $h_{\mathbf{w}}(\mathbf{x}) < 0.5$ , predict 0.

# Logistic Regression

Hypothesis:  $h_{\mathbf{w}}(\mathbf{x}) = \sigma(\mathbf{w}^T \mathbf{x})$ , where

$$\sigma(t) = \frac{1}{1 + e^{-t}}$$

is the **sigmoid function**.

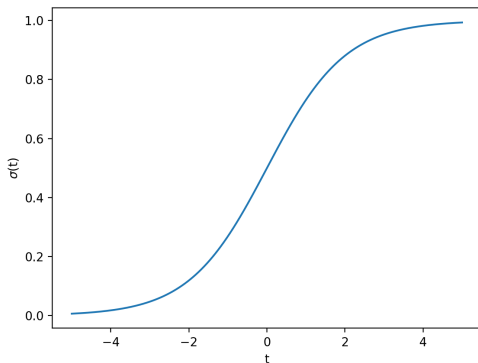


Figure: Sigmoid function

# Decision boundary

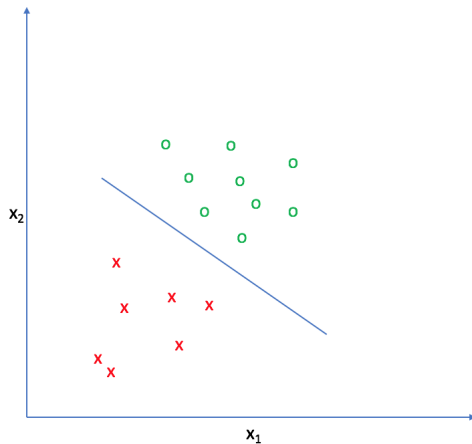


Figure: Trivial example of decision boundary