

Chapter 1 Introduction to ML & DL

Goal - Introduce framework

- 1) data
 - 2) model
 - 3) loss
- } Train

- Illustration / Motivation
 - linear Regression
 - image classification

(1) dataset y

Regression



x input "income" \mathbb{R}^d
 y output "Happiness"

- "Tabular datasets"

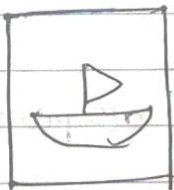
- Image classification

x - Image

y - class $\in \{1, \dots, K\}$

Number of classes

$y = \text{"boat"} = 05$



$\mathbb{R}^{40 \times 40}$

grey

$\mathbb{R}^{3 \times 40 \times 40}$

RGB

dim $\geq \mathbb{R}$

$\rightarrow \{(x_i, y_i)_{i=1:N} \rightarrow \text{Number of elements}$

Model

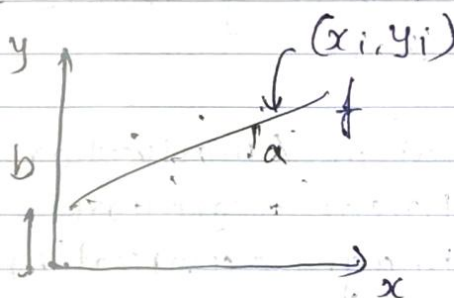
- supervised when y_i is known.



- linear Regression

$$f(x) = ax + b$$

↑ ↑
parameters



- Notation

$\theta = \{a, b\}$ parameters in f .

$f(x) = \hat{y}$
↑
 x input output
parameters



Question: find ^{the} best parameter θ ?

③ Loss function

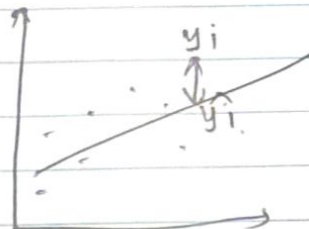
- Goal measure how "good / bad" are parameters?

loss

Regression - Mean Squared Error

$$J_i = |y_i - \hat{y}_i|^2$$

$$J = \frac{1}{N} \sum_{i=1}^N |y_i - \hat{y}_i|^2$$



$$J(\theta) = \frac{1}{N} \sum_{i=1}^N |y_i - f_{\theta}(x_i)|^2 \quad \text{--- (I)}$$

Remark $\{x_i, y_i\}_{i=1:N}$ are fixed

Once we have ①, ②, ③ then we train

$$\min_{\theta} J(\theta)$$

$$\theta_* = \arg \min_{\theta} J(\theta)$$

 --- (3)

