Tutorial 4
Clasificador simple

Los Pilares del Deep Learning

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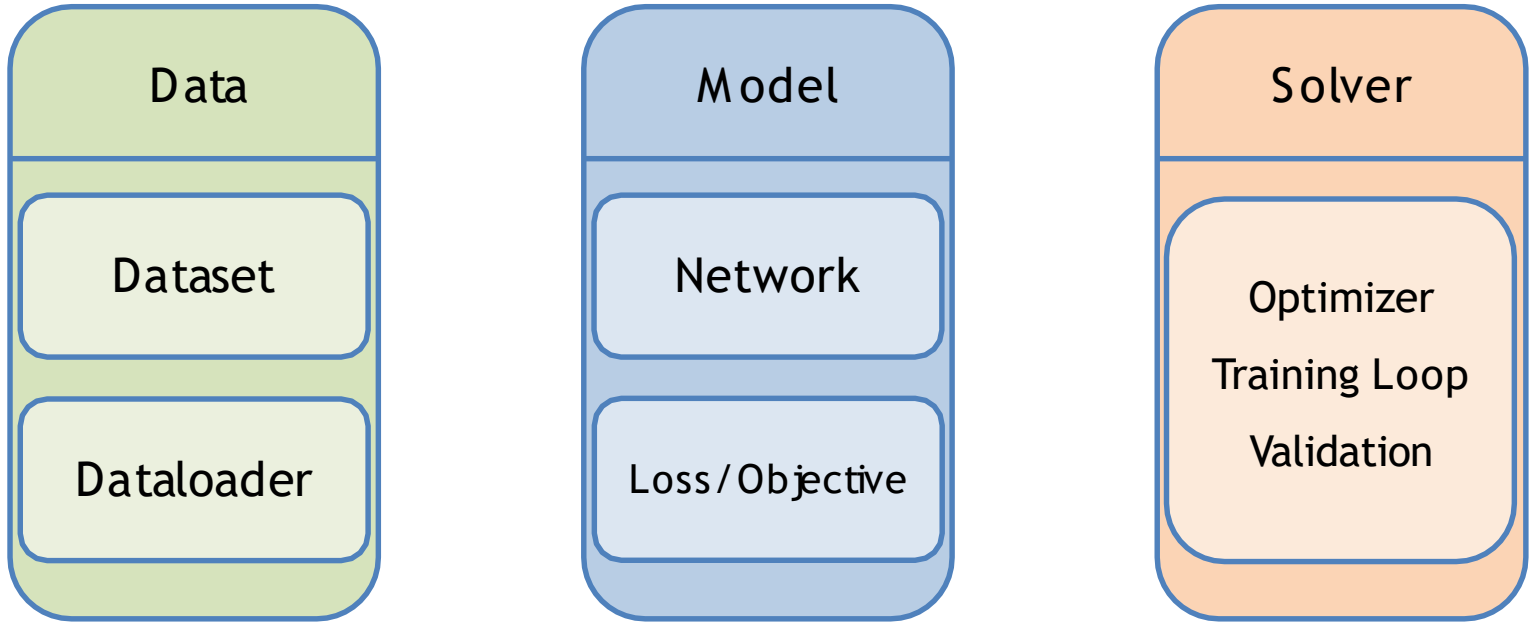
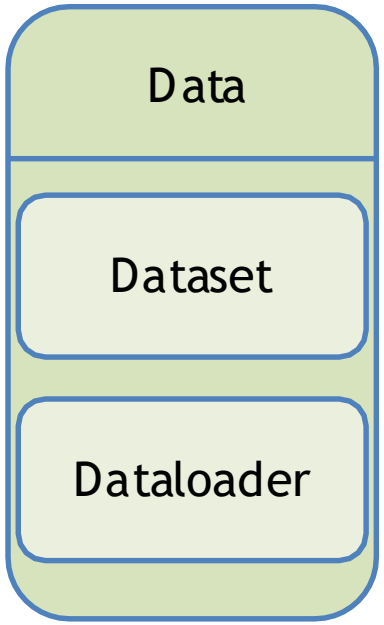


Los Pilares del Deep Learning



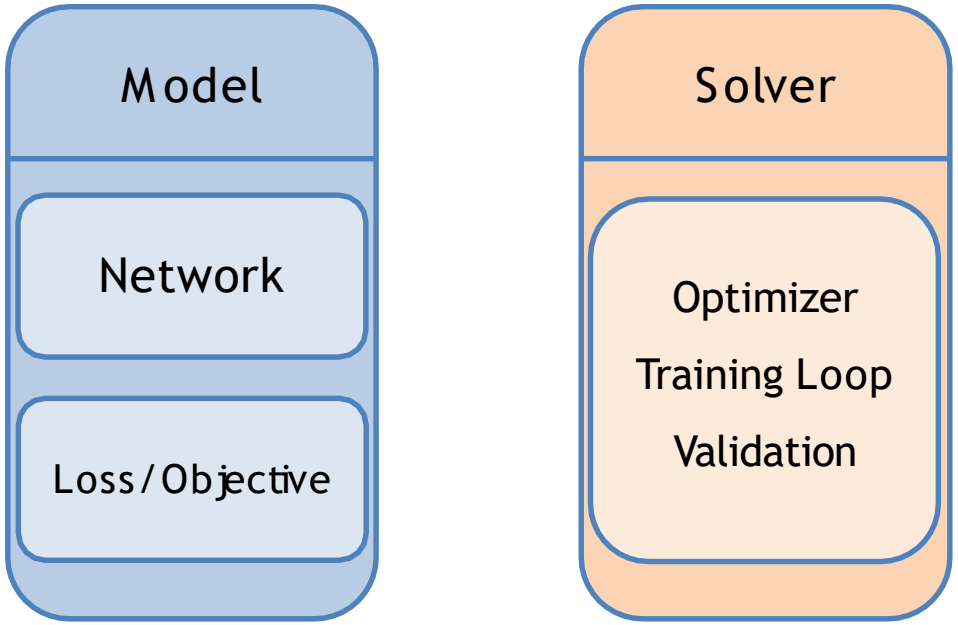
Exercise 3: Dataset and Dataloader

Los Pilares del Deep Learning

Exercise 4: Simple Classifier

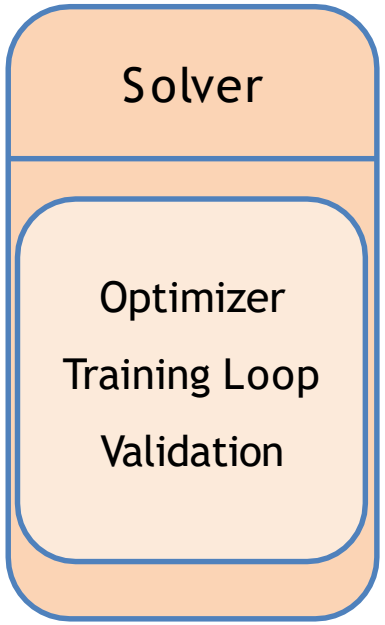
Exercise 5: Simple Network

Exercise 6: Hyperparameter Tuning



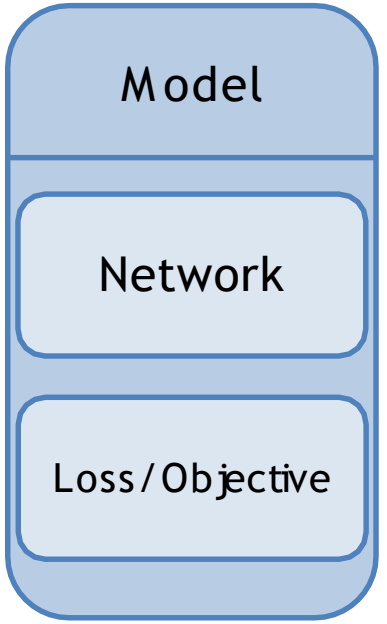
Objetivo: Ejercicio 4

- Goal: Training process
- Skip: Model Pillar
- Simplified Model: Classifier which is a 1-Layer Neural Network



Objetivo: Ejercicio 5++

- Ex 3 + 4: Dataloading and Trainings process
- Ex 5++: Expand the exercises to more interesting model architectures



Ejercicio 4
Clasificador simple

Housing Dataset

- Housing Dataset: Data of ~1400 casas incluyendo 81 features como
  - Neighborhood, GrLivArea, YearBuilt, etc.

- Simplified model: 1 input feature para predecir el precio de la casa

housing_train

Id	Neighborhood	BldgType	HouseStyle	YearBuilt	YearRemodAdd	RoofStyle	CentralAir	GrLivArea	FullBath	HalfBath	Fireplaces	PoolArea	Fence	SalePrice
1	CollgCr	1Fam	2Story	2003	2003	Gable	Y	1710	2	1	0	0	NA	208500
2	Veenker	1Fam	1Story	1976	1976	Gable	Y	1262	2	0	1	0	NA	181500
3	CollgCr	1Fam	2Story	2001	2002	Gable	Y	1786	2	1	1	0	NA	223500
4	Crawfor	1Fam	2Story	1915	1970	Gable	Y	1717	1	0	1	0	NA	140000
5	NoRidge	1Fam	2Story	2000	2000	Gable	Y	2198	2	1	1	0	NA	250000
6	Mitchel	1Fam	1.5Fin	1993	1995	Gable	Y	1362	1	1	0	0	MnPrv	143000
7	Somerst	1Fam	1Story	2004	2005	Gable	Y	1694	2	0	1	0	NA	307000
8	NWAmes	1Fam	2Story	1973	1973	Gable	Y	2090	2	1	2	0	NA	200000

Ejercicio 4 – Clasificando el precio de las propiedades

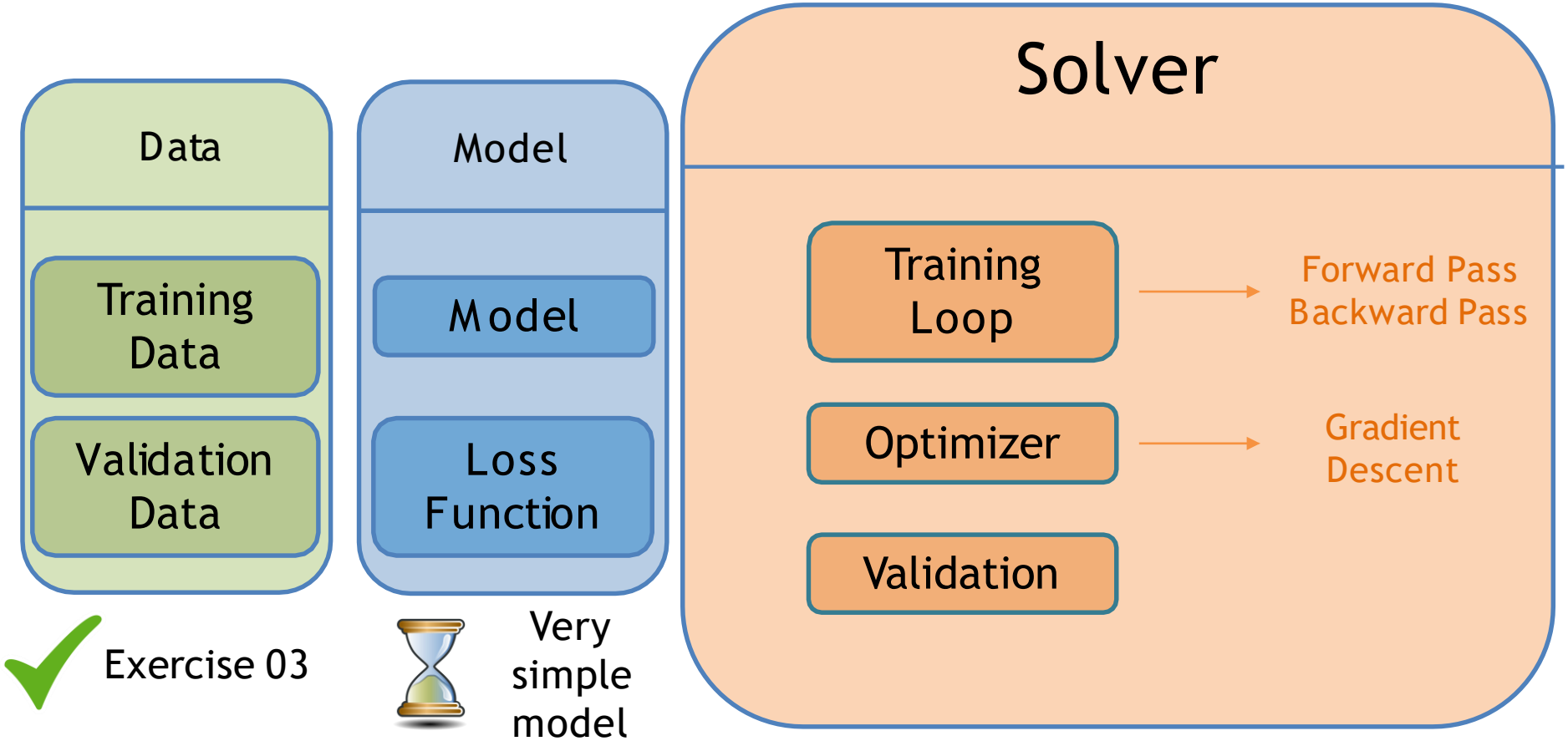
$$M$$
$$M(\mathbf{x}) = \mathbf{y}$$

Expensive $y = 1$

$$M$$
$$M(\mathbf{x}) = \mathbf{y}$$

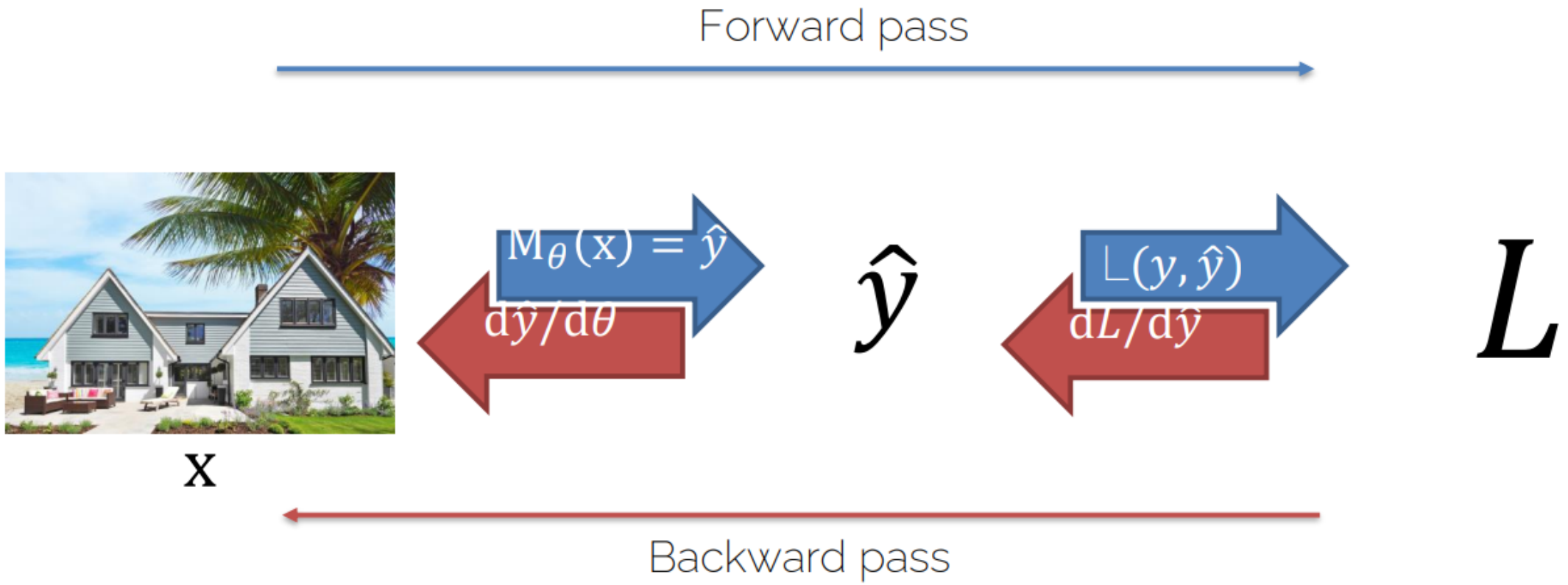
Low-priced $y = 0$

3er Pilar del Deep Learning



Backpropagation

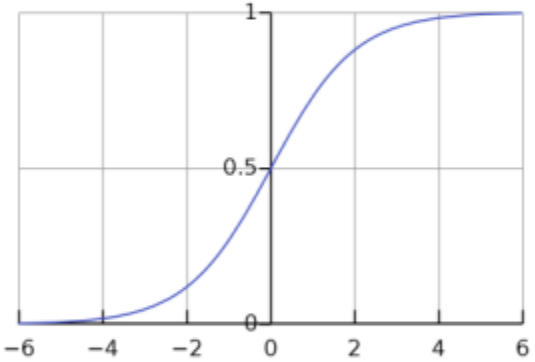
Backpropagation: Loss Function



Binary Cross Entropy Loss: $L(y, \hat{y}) = y \cdot log(\hat{y}) + (1 - y) \cdot log(1 - \hat{y})$

Backpropagation

- Input: $X \in \mathbb{R}^{N \times D+1}$ representing our data with N samples and D+1 feature dimensions
- Output: Binary labels given by $y \in \mathbb{R}^{N \times 1}$
- Model: Classifier of the form $y = \sigma(X \cdot w)$
- Sigmoid function: $\sigma : \mathbb{R} \to [0, 1]$ with $\sigma(t) = \frac{1}{1+e^{-t}}$



σ Function

- Weights of the Classifier: $w = (w_1, w_2, \ldots, w_{D+1})\top \in \mathbb{R}^{D+1}$

Backpropagation: Ejemplo

Forward Pass

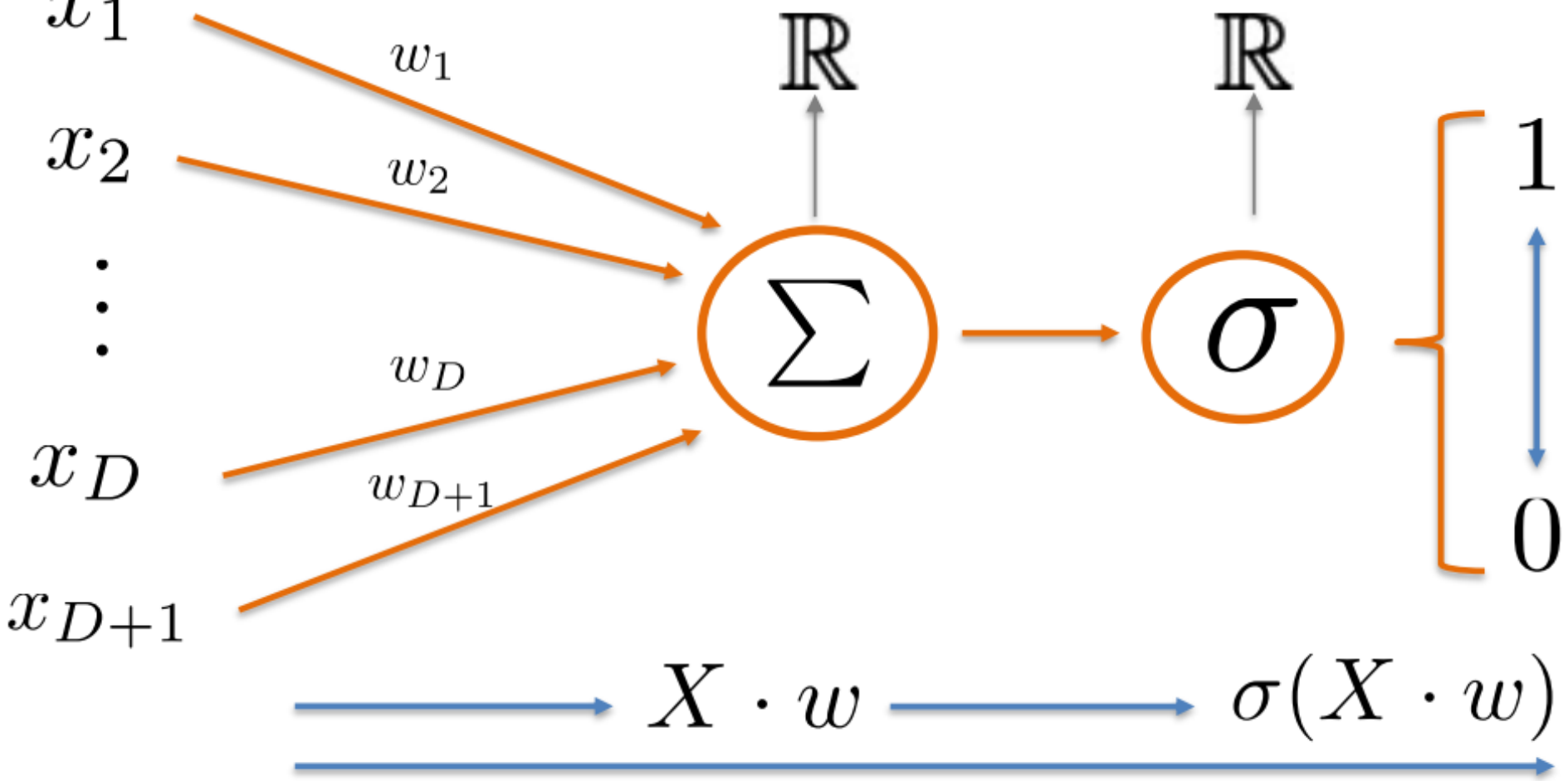
(Single sample)

Sample

$x = (x_1, x_2, \ldots, x_{D+1})$

Classifier Model

$y = \sigma(X \cdot w)$



Input Data X

$$X \in \mathbb{R}^{N \times D+1}$$

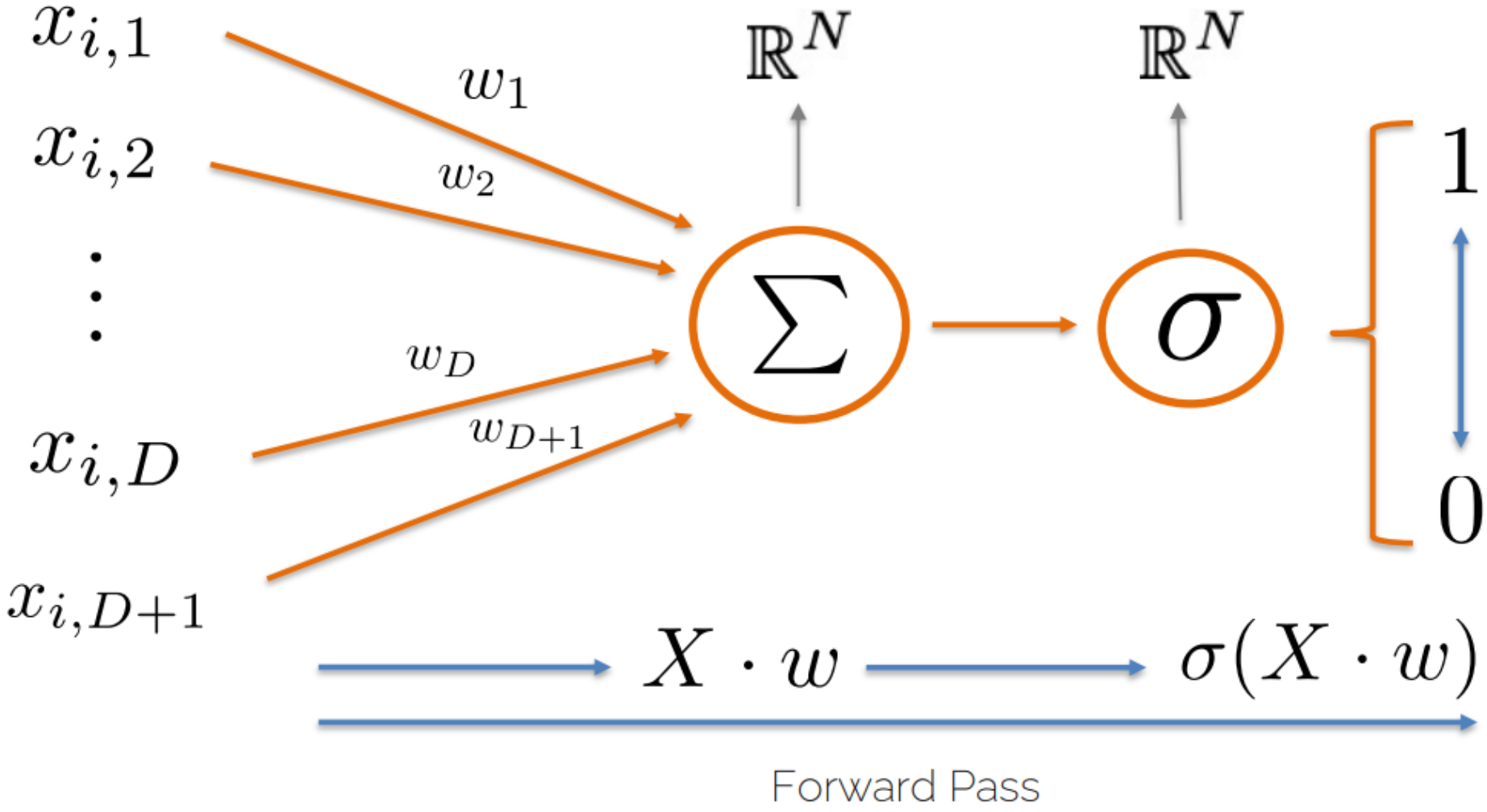
$$X = \begin{pmatrix} x_{1,1} & x_{1,2} & \dots & x_{1,D+1} \\ x_{2,1} & x_{2,2} & \dots & x_{2,D+1} \\ \vdots & \vdots & \ddots & \vdots \\ x_{N,1} & x_{N,2} & \dots & x_{N,D+1} \end{pmatrix}$$

Forward Pass

(N samples)

Sample

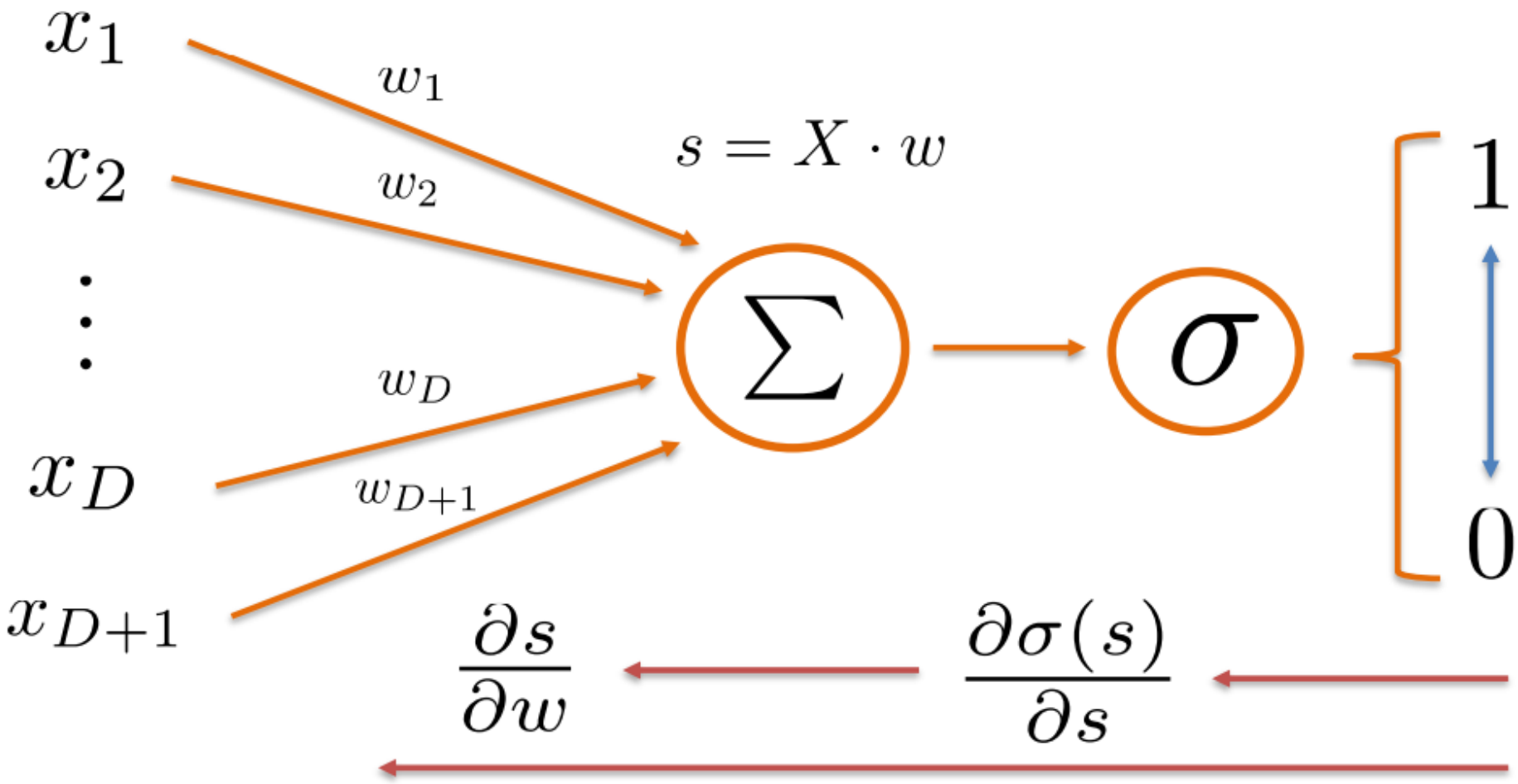
$x_i = (x_{i1}, x_{i2}, \ldots, x_{i,D+1})$



Forward Pass

Backward Pass

Sample
$x = (x_1, x_2, \ldots, x_{D+1})$



Backward Pass

Resumen Ejercicio 4

- 2 Notebooks
  - Optional: Preprocessing
  - Logistic Regression model

- Submission
  - Implementaciones en los notebooks
  - Submission file creation en Notebook

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