Introducción a Network Analytics

Bob Smith

School of Computer Science
Go University

January 14, 2025

Basic

Graph is a data structure and is defined by $G = (V, E)$, where V is the set of nodes and E is the set of edges.

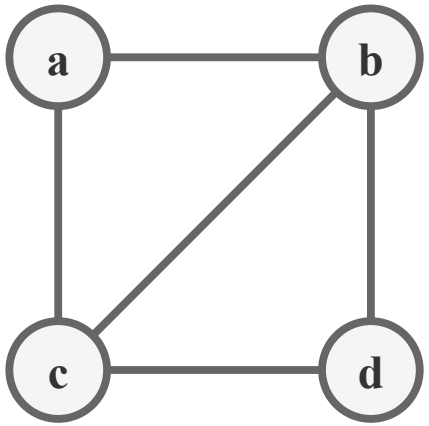


Figure 1: Graph example.

Two columns

- Homogeneous graph
- Heterogeneous graph
- Directed graph
- Undirected graph
- Weighted graph
- Bipartite graph
- Complete graph
- Degree
- Density
- Diameter

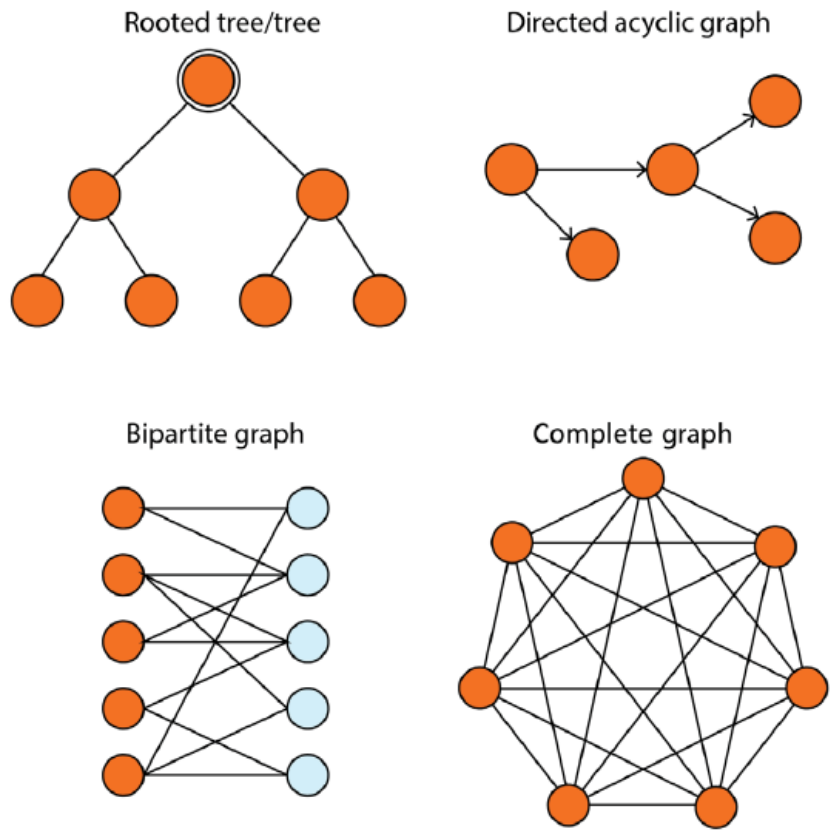


Figure 2: Common type of graphs. Adapted from [1].

Items multicolumns

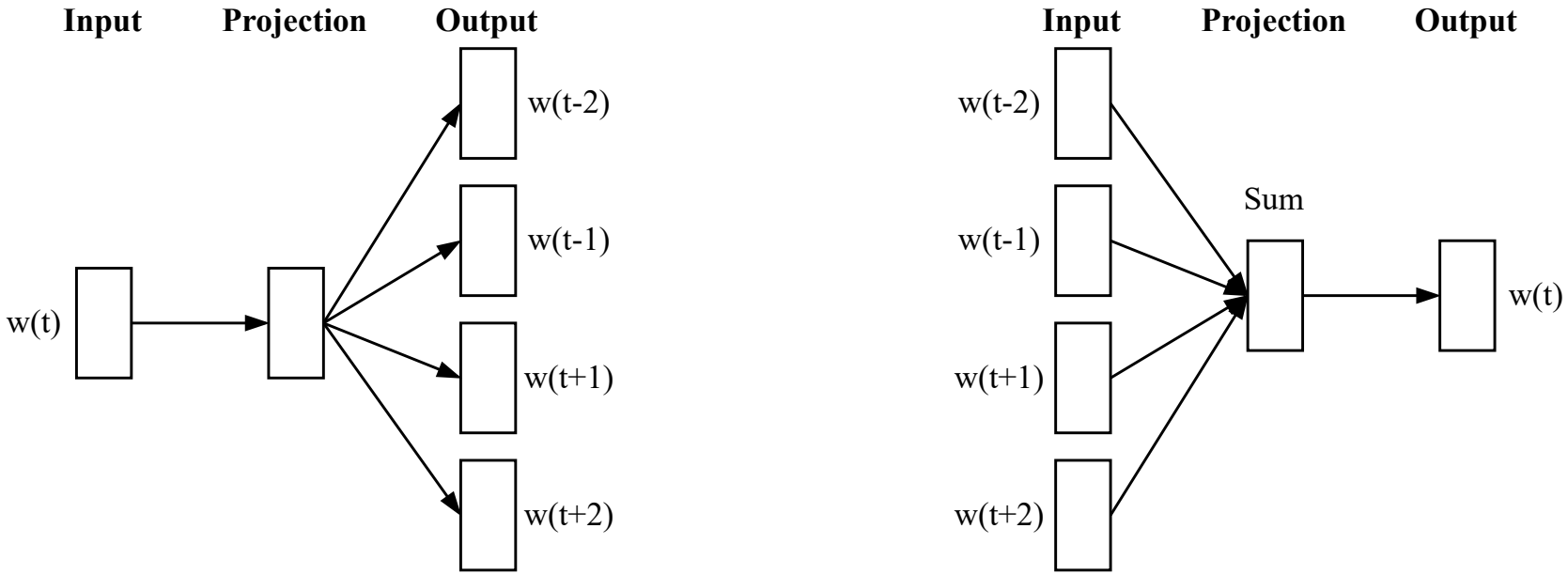
- Computer vision
- Natural language processing
- Recommender systems
- Program analysis
- Knowledge graphs
- Bioinformatics
- Chemistry
- Biology
- Physic
- Anomaly detection
- Urban intelligence
- Financial transaction
- ...

Items and subitems

1. Class 1
2. Class 2
3. Class 3
   n+e Student 1

- A
- B
- C
  - C-1

Subfigures



(a) Skip-gram.

(b) CBOW.

Figure 3: Word embedding architectures. Adapted from [2].

Equations

$$V = \frac{4}{3}\pi r^3 \tag{1}$$

Equation without numbers

$$J(\theta) = \mathbb{E}_{\pi_\theta}[G_t] = \sum_{s \in \mathcal{S}} d^\pi(s) V^\pi(s) = \sum_{s \in \mathcal{S}} d^\pi(s) \sum_{a \in \mathcal{A}} \pi_\theta(a|s) Q^\pi(s,a) \tag{2}$$

$$cos(\theta) = \text{sim}(z_i, z_j) = \frac{z_i . z_j}{\|z_i\| \|z_j\|} \tag{3}$$

Equations multiline

Equation with numbers

$$\begin{aligned} A = \lim_{n\to\infty} \Delta x \Big(a^2 + \Big(a^2 + 2a\Delta x + (\Delta x)^2\Big) \\ + \Big(a^2 + 2\cdot 2a\Delta x + 2^2(\Delta x)^2\Big) \\ + \Big(a^2 + 2\cdot 3a\Delta x + 3^2(\Delta x)^2\Big) \\ + \ldots \\ + \Big(a^2 + 2\cdot (n-1)a\Delta x + (n-1)^2(\Delta x)^2\Big)\Big) \\ = \frac{1}{3}\left(b^3 - a^3\right) \end{aligned} \quad (4)$$

Algorithm

Algorithm 1: Find Maximum Element in an Array.

Input : An array A of n integers
Output: Maximum element in the array

```
1  y ← 1
2  X ← x
3  N ← n
4  while N ≠ 0 do
5      if N is even then
6          X ← X × X
7          N ← N/2                          /* This is a comment */
8      else
9          if N is odd then
10             y ← y × X
11             N ← N − 1
12 return max
```

Tables

Table 1: Definition.

Eq.	Def.	A	B	C
1	4.0	0	1	4.0
2	3.7	7	7	6.99

Please check the definition of Equation (1) in Table 1.

Figures

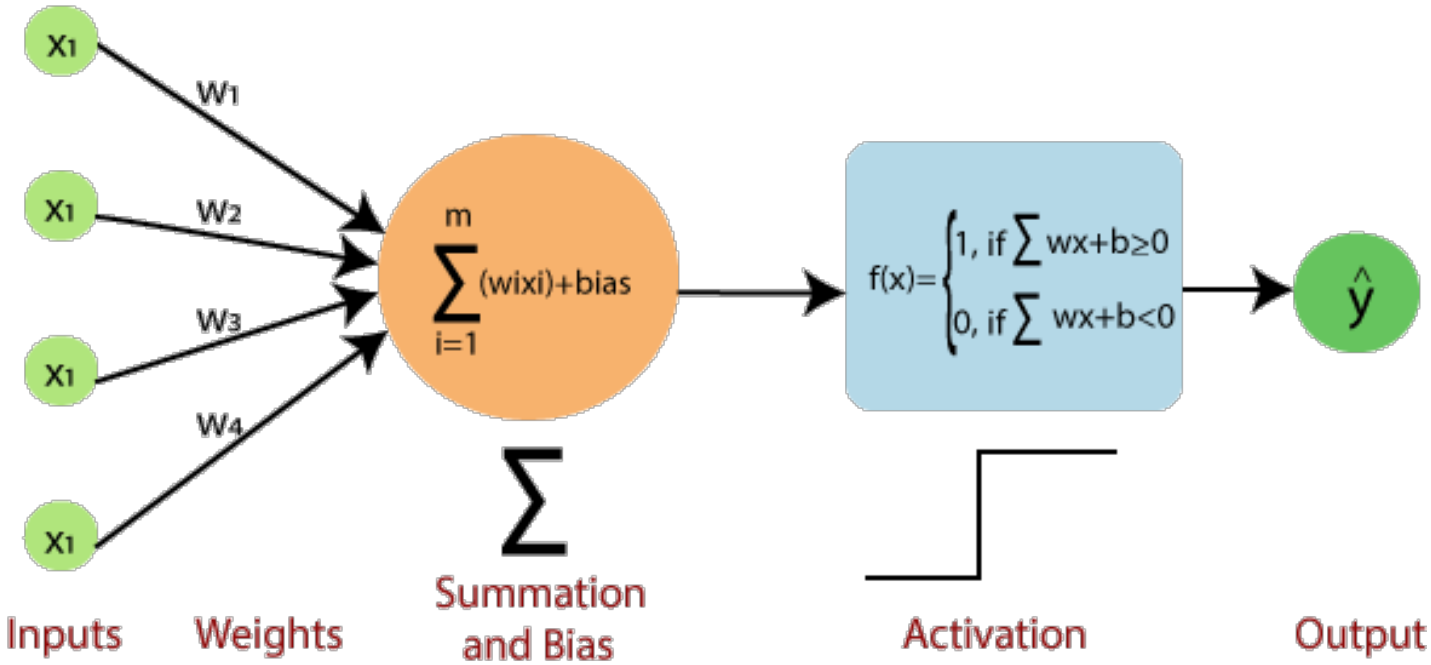


Figure 4: Basic NN.
From `https://www.javatpoint.com/single-layer-perceptron-in-tensorflow`.

Video

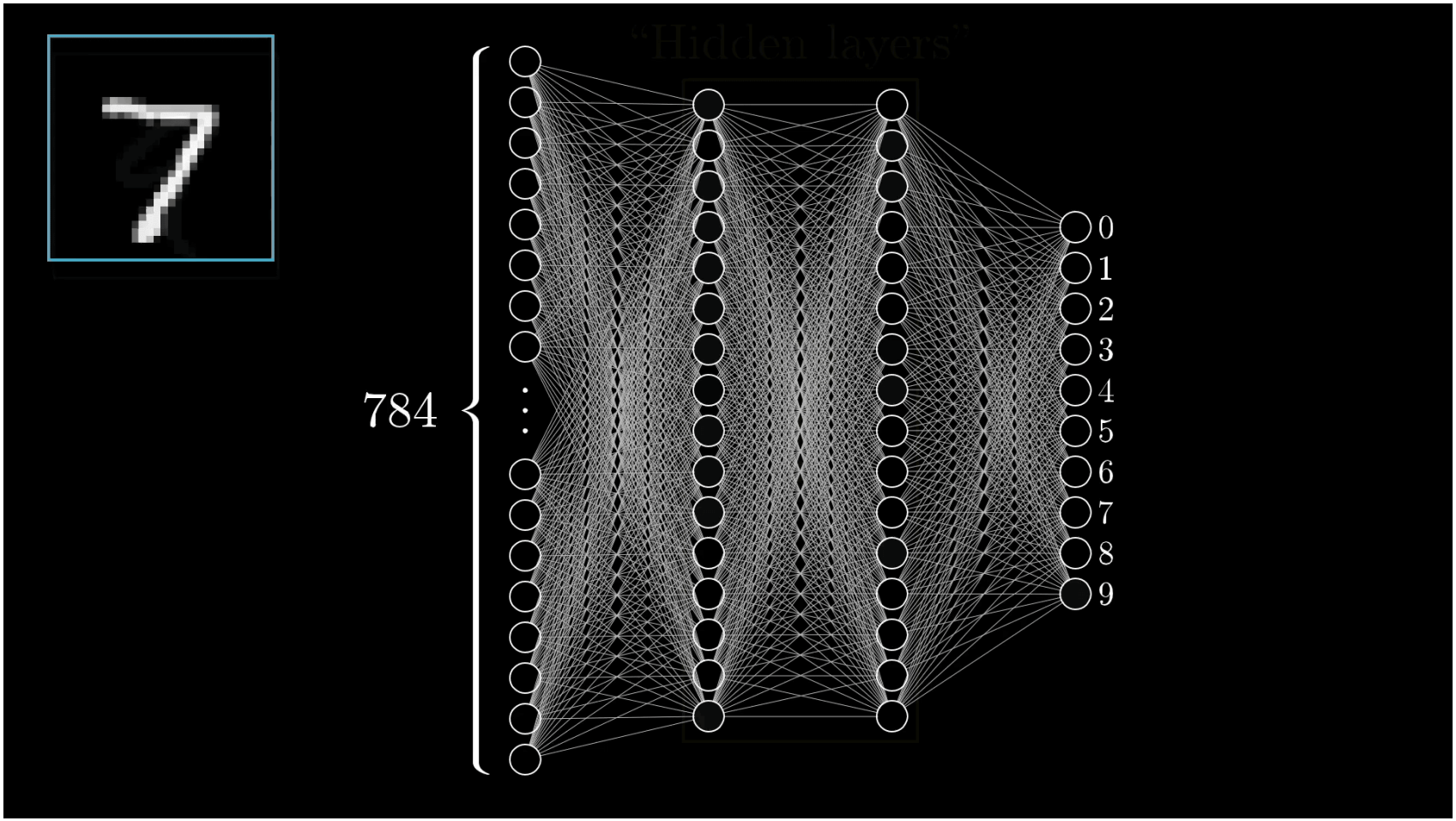


Figure 5: Image classification. From `https://www.3blue1brown.com/lessons/neural-networks`.

Thank you for your attention!

∞

edwin.alvarez@pucp.edu.pe
https://github.com/win7

[1] Maxime Labonne.
Hands-On Graph Neural Networks Using Python: Practical techniques and architectures for building powerful graph and deep learning apps with PyTorch.
Packt Publishing Ltd, 2023.

[2] Tomas Mikolov, Kai Chen, Greg Corrado, and Jeffrey Dean.
Efficient estimation of word representations in vector space.
arXiv preprint arXiv:1301.3781, 2013.