Deep Learning and Neural Networks

Understanding the Basics

What is Deep Learning?

Deep learning refers to the process of training neural networks

- Inspired by human brain structure
- Uses multiple layers of neurons
- Learns complex patterns from data
- Foundation of modern AI systems

What are Neural Networks?

Groups of nodes (neurons) that represent mathematical functions

Receive Data

Each node receives numerical values as input

Process Data

Performs mathematical operations on input values

Transmit Results

Sends processed result to the next node

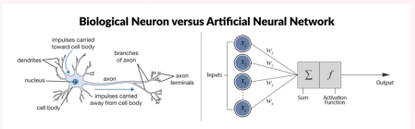
Network Structure

Nodes organized in interconnected layers

Inspired by how the **human brain works** — neurons receive signals, aggregate them, and emit new signals

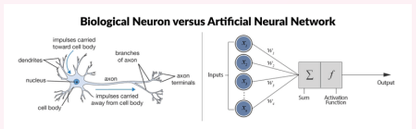
Biological vs. Artificial Neurons

Biological Neuron

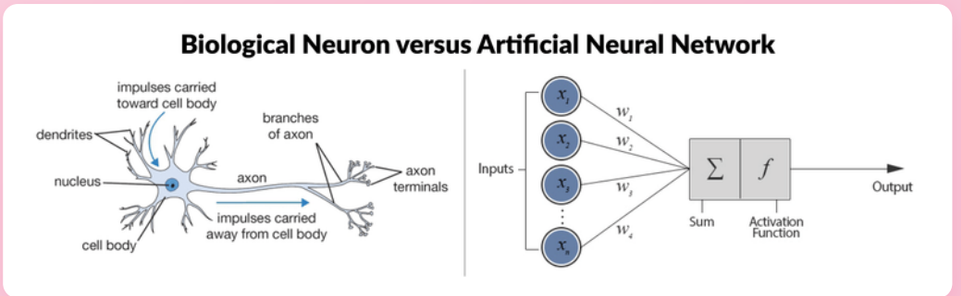


- **Receives** electrical signals from other neurons
- **Aggregates** signals in the cell body
- **Emits** new signal based on input threshold

Artificial Neuron



- **Receives** numerical values as inputs
- **Performs** mathematical operations on inputs
- **Passes** result to next node in network



Structure of Neural Networks

Three Main Components

Input Layer

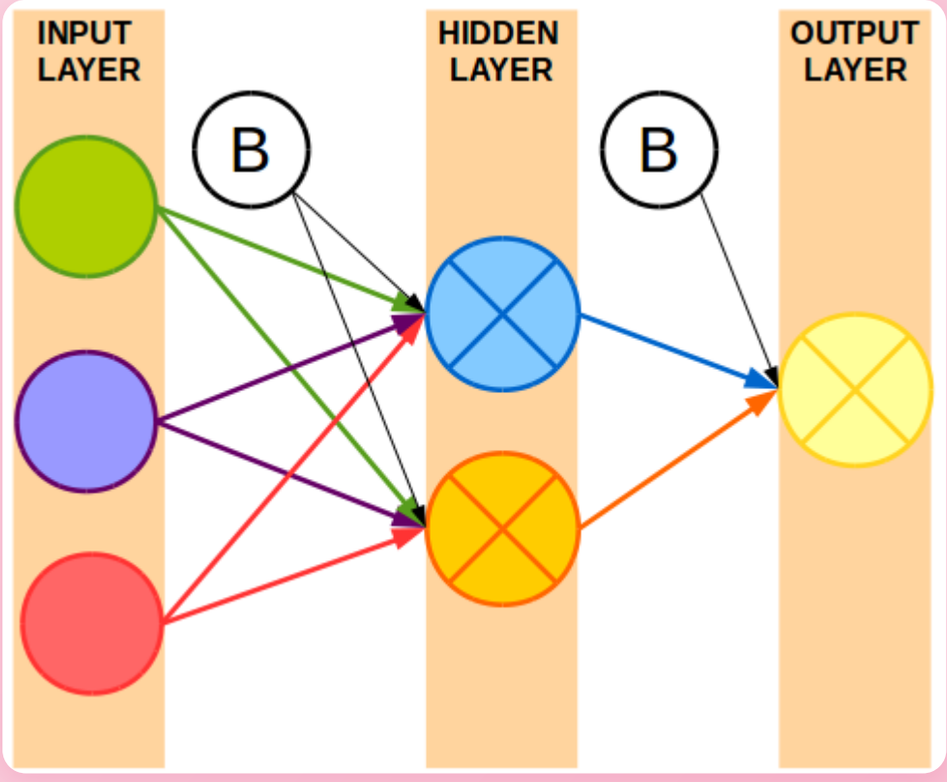
Receives the data that the network is supposed to learn from

Hidden Layers

Process the data through mathematical operations
Called "hidden" because intermediate results are not observable

Output Layer

Provides the final result that the network was trained to produce



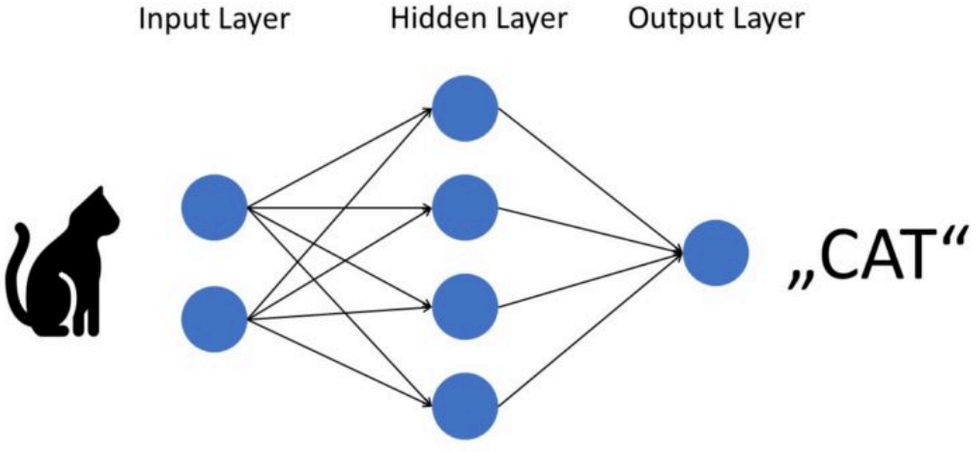
Cat Recognition Example

How Neural Networks Identify Cats

1. **Input Layer**
   Receives pixel values of the image

2. **Hidden Layers**
   Process values through mathematical operations

3. **Output Layer**
   Produces final classification result



0	1
Not a Cat	Is a Cat

Counting Layers in Neural Networks

How to Count Layers Properly

Important Rule

The **input layer** is not counted among the layers—it's denoted as **layer 0**.
Total number of layers = **hidden layers + output layer**

Example

Total Layers = 2 (1 hidden + 1 output)