

# Deep Learning Intuition

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DEEP LEARNING is transforming the way machines understand, learn and interact with complex data.

Deep learning mimics neural networks of the human brain, it enables computers to autonomously uncover patterns and make informed decisions from vast amount of data.

- Why Deep learning is becoming popular?

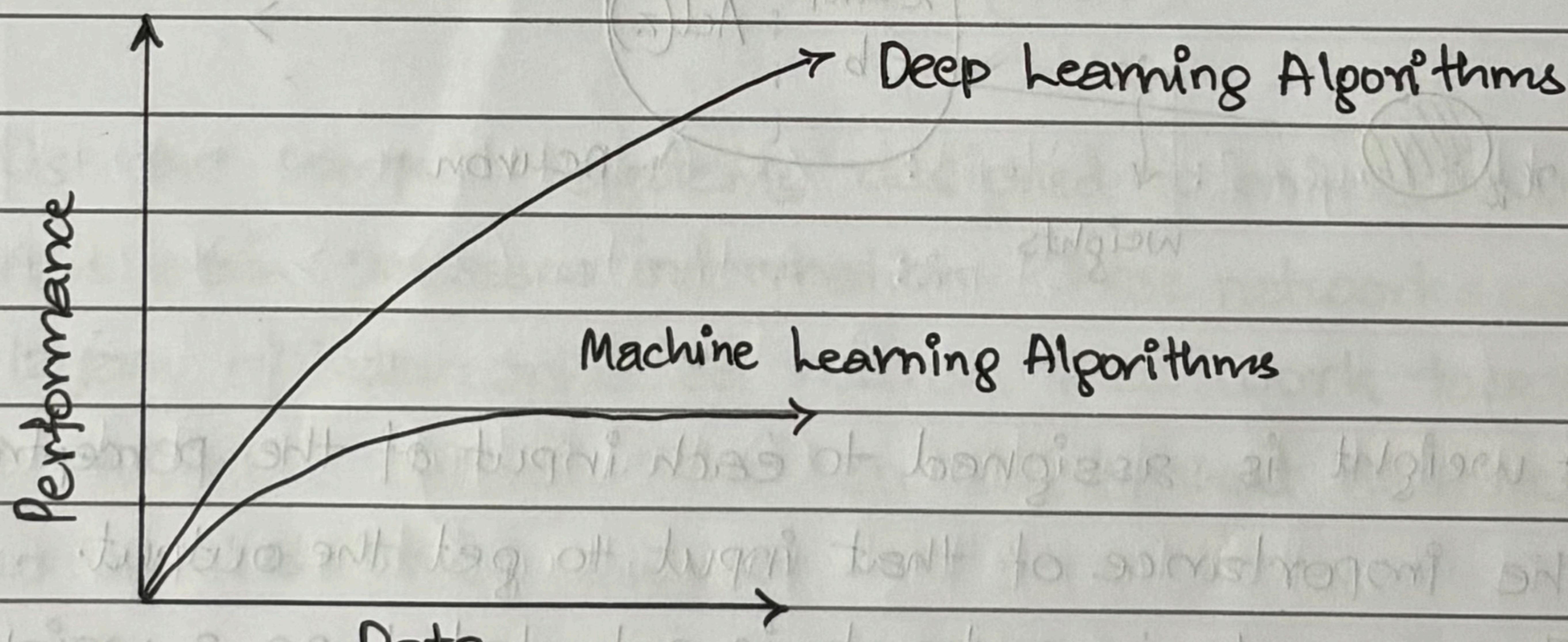
2005: Facebook, YouTube, LinkedIn → Social Media Platforms

2011-12: Data was generated exponentially ↴

↳ Big Data → Hadoop → Huge amount of Data

↳ Hardware Requirement → GPU costs ↴

↳ Recommendation Systems: Netflix, data from interaction



→ Deep learning is been used in many domains: Medical, Ecommerce...

→ Open Source Frameworks: Tensorflow, PyTorch  
(users increased)

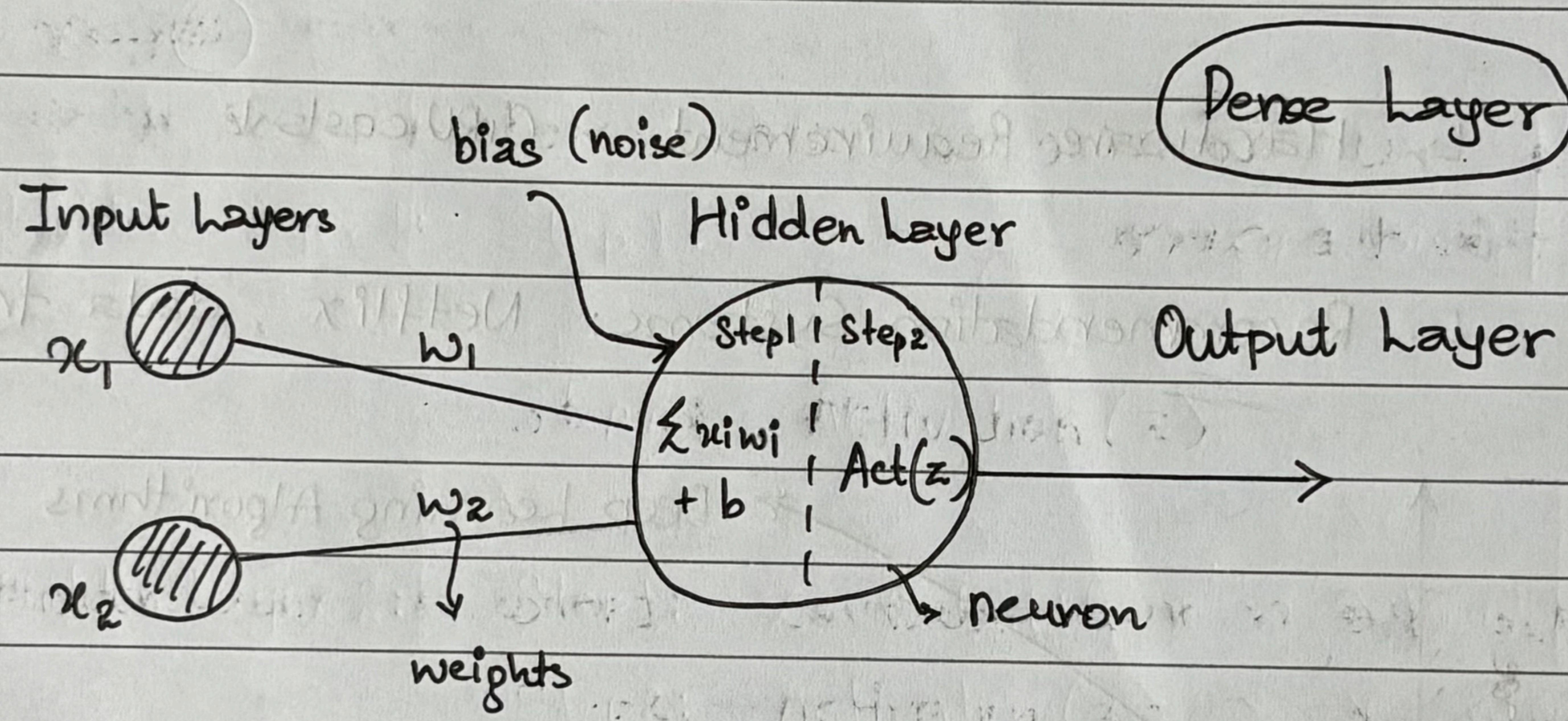
## → How Deep learning works?

Neural Networks consists of layers of connected nodes or neurons that collaborate to process input data.

In a fully connected deep neural network, data flows through multiple layers where each neuron performs non-linear transformations, allowing the model to learn intricate representations of data.

## • PERCEPTRON : Single Layered Neural Network.

It is primarily used for Binary Classification. It is particularly good at learning linearly separable patterns. It utilizes a variation of artificial neurons called Threshold logic Units.



A weight is assigned to each input of the perceptron, indicating the importance of that input to get the output.

The perceptron's output is calculated as a weight sum of the inputs,  $[z = \sum_{i=1}^n x_i w_i + b]$

which is then passed through an activation function.

The step function compares this weighted sum to a threshold.

$$h(z) = \begin{cases} 0 & \text{if } z < \text{Threshold} \\ 1 & \text{if } z \geq \text{Threshold} \end{cases}$$

# Deep Learning

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Output of the fully connected layer:  $[f_{wb}(x) = h(xw + b)]$

During training the Perceptron's weights are adjusted to minimize the difference between the predicted output and the actual output using delta rule or perceptron learning rule.

$$[w_{i,j} = w_{i,j} + \eta (y_i - \hat{y}_i) x_i]$$

actual      predicted

$w_{i,j}$  → weight b/w  $i^{th}$  and  $j^{th}$  output neuron

( $\eta$ )  $\rightarrow$  learning rate, controlling the weights.

Multi Layered Perceptron: Possess enhanced processing capabilities as they consist of two or more layers, adept at handling more complex patterns and relationships within the data.

## • ARTIFICIAL NEURAL NETWORK (ANN)

ANNS are computer systems designed to mimic how the human brain processes information. These networks consists of layers of interconnected neurons that work together to solve complex problems. The key idea is that ANNs can learn from the data they process.