

DEEP

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Artificial Neural Network

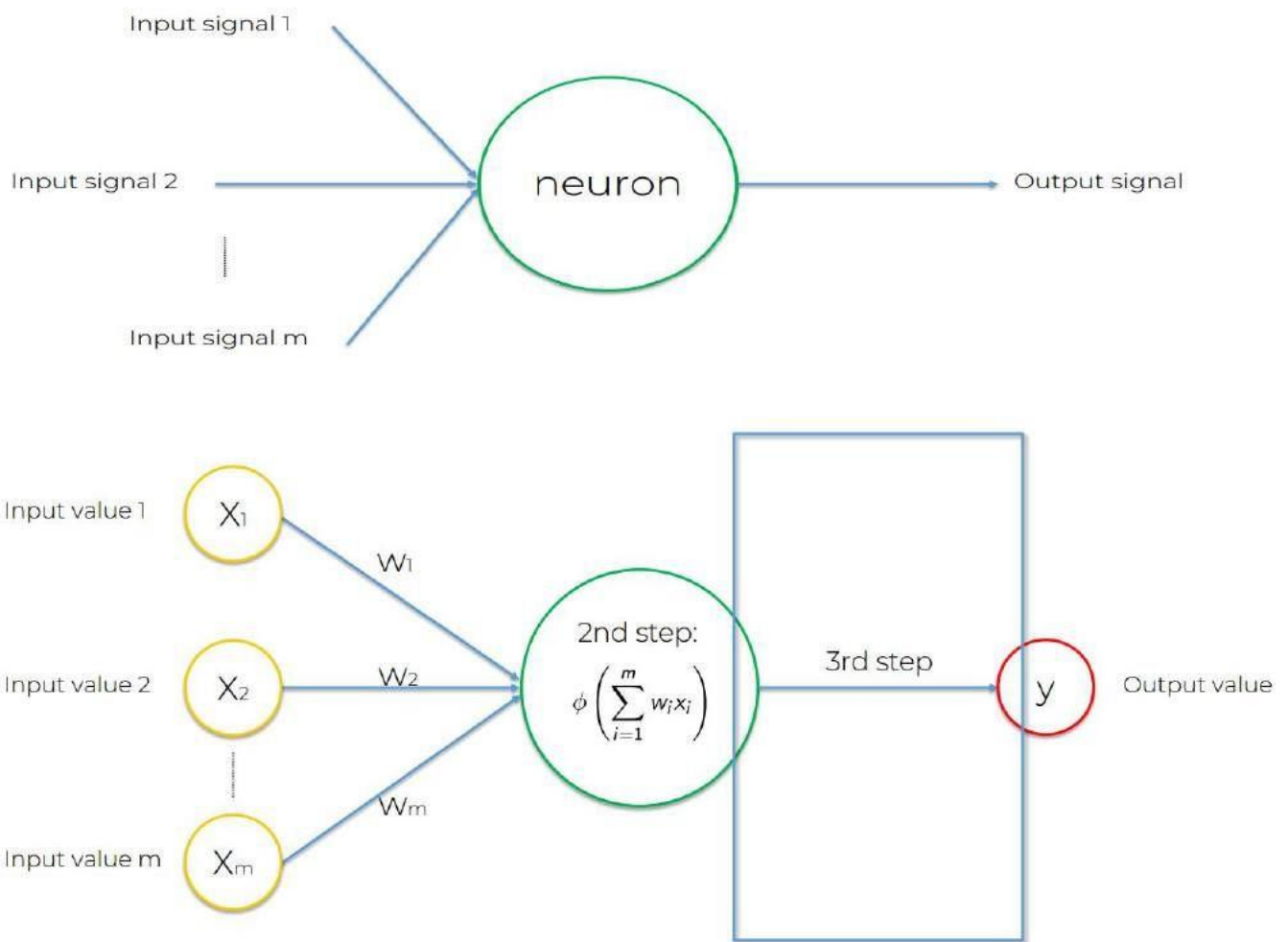
Introduction

Artificial Neural Network also known as ANN is the Sub Domain of Deep Learning.

ANN is used to perform Regression as well as classification model building.

Neuron

Inspired by the biological neurons found in the human brain, artificial neurons are simplified mathematical models designed to process and transmit information through interconnected layers within the network.

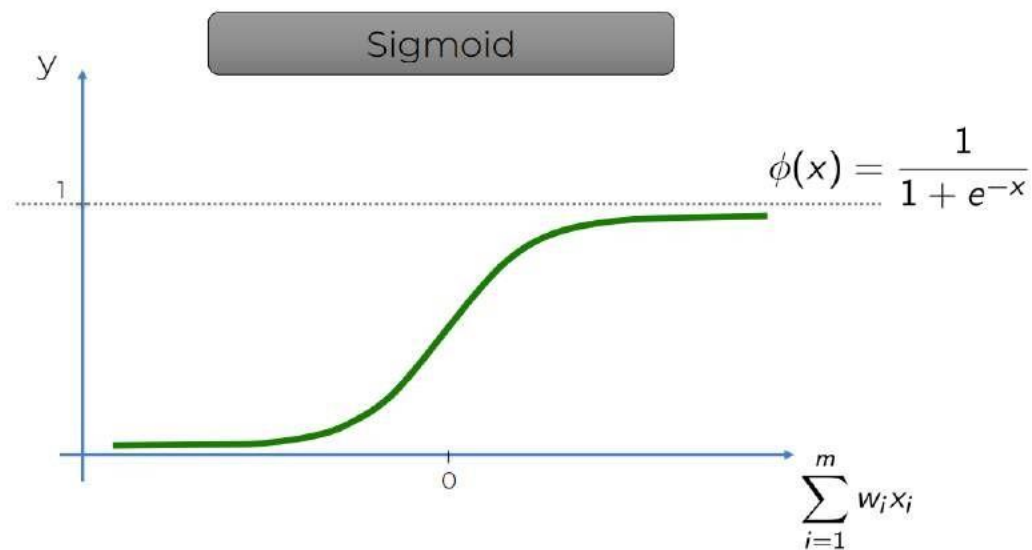


Activation Function

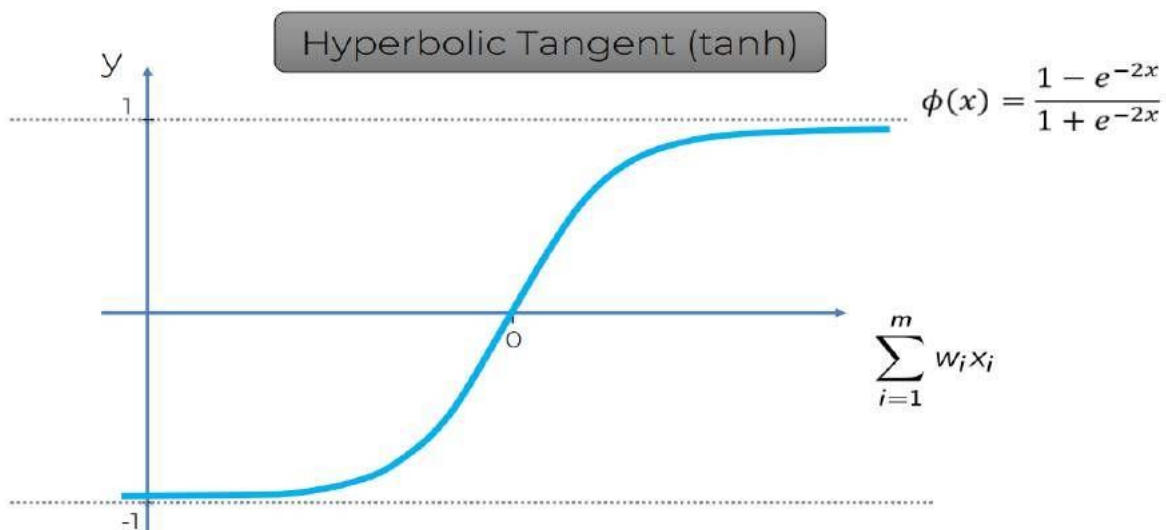
Activation functions operate on the weighted sum of inputs and bias terms within each neuron and determine whether the neuron should be activated (i.e., produce an output signal) or not.

Commonly used activation functions in deep learning:

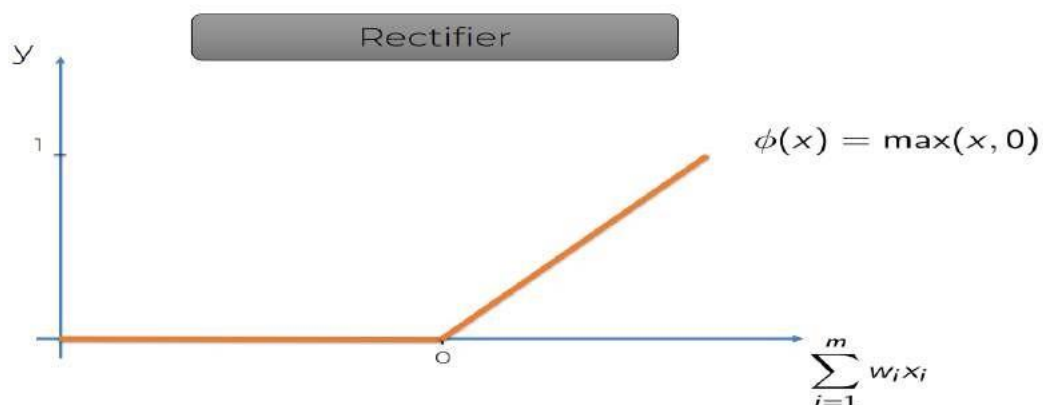
1. Sigmoid Function



2. Hyperbolic Tangent Function (tanh)

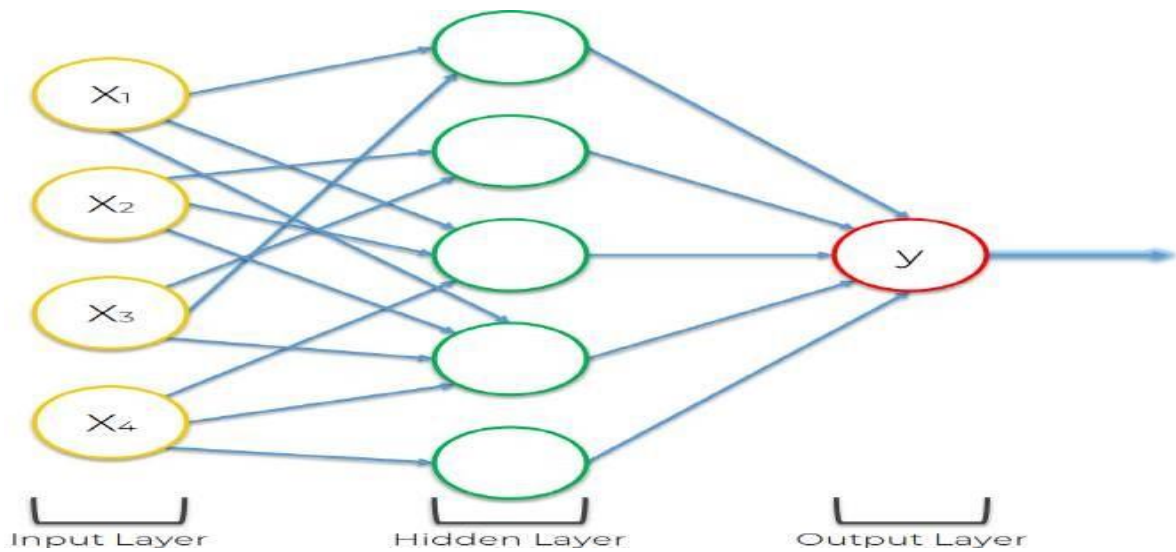


3. Rectified Linear Unit (ReLU)



How Neural network works?

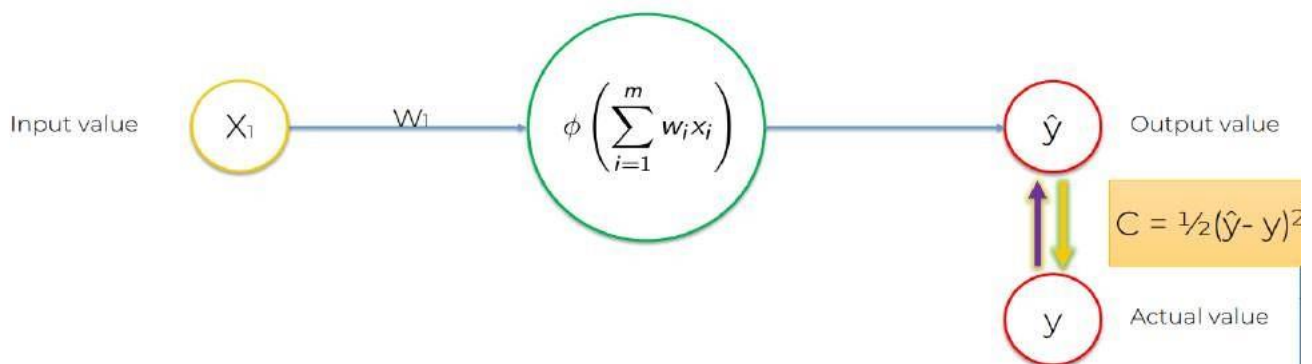
Input layer connection with n no of hidden layers and at end hidden layer is connected to output layer.



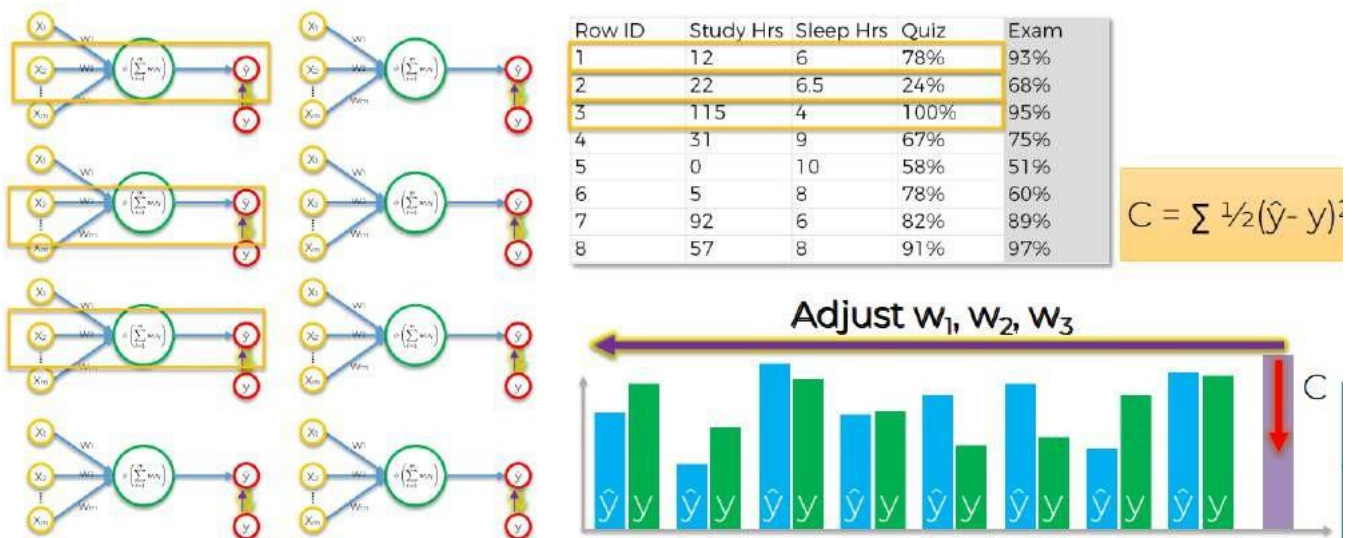
Cost Function

- A cost function, also known as a loss function or objective function, is a critical component in the training of machine learning models, including neural networks.
- It quantifies the difference between the predicted output of the model and the actual target values for a given set of input data.
- The goal during training is to minimize this cost function, effectively optimizing the model's parameters to make accurate predictions.

Stochastic Gradient Descent (SGD)



- Stochastic Gradient Descent (SGD) is a fundamental optimization algorithm used in training machine learning models, including neural networks.
- It is a variant of the standard gradient descent algorithm that aims to efficiently minimize the cost function by updating the model parameters iteratively based on a randomly selected subset of training examples at each iteration.



Applications of ANN

1. Natural Language Processing (NLP):

- Recurrent Neural Networks (RNNs) and Transformers are widely used for tasks like language translation, sentiment analysis, text generation, and chatbots.

2. Speech Recognition and Synthesis:

- ANNs, including recurrent and convolutional architectures, are employed for speech recognition, speaker identification, and text-to-speech synthesis.

3. Predictive Analytics and Time Series Forecasting:

- ANNs, including Long Short-Term Memory (LSTM) networks, are utilized for predicting future trends, forecasting financial markets, and analysing time-dependent data.
- Applications span finance, weather forecasting, energy demand prediction, and stock market analysis.

4. Healthcare and Biomedical Engineering:

- ANNs play a crucial role in medical diagnosis, disease detection, drug discovery, and personalized medicine.

Conclusion

In conclusion, artificial neural networks (ANNs) represent a cornerstone in the realm of artificial intelligence and machine learning, offering a powerful framework for solving a diverse array of tasks across various domains. Throughout this article, we've delved into the intricacies of ANNs, exploring their structure, functionality, and applications.

At their core, ANNs mimic the structure and functionality of the human brain, comprising interconnected nodes, or neurons, organized in layers. Through a process of iterative training, ANNs learn complex patterns and relationships from data, adjusting their parameters to minimize the difference between predicted and actual outputs.