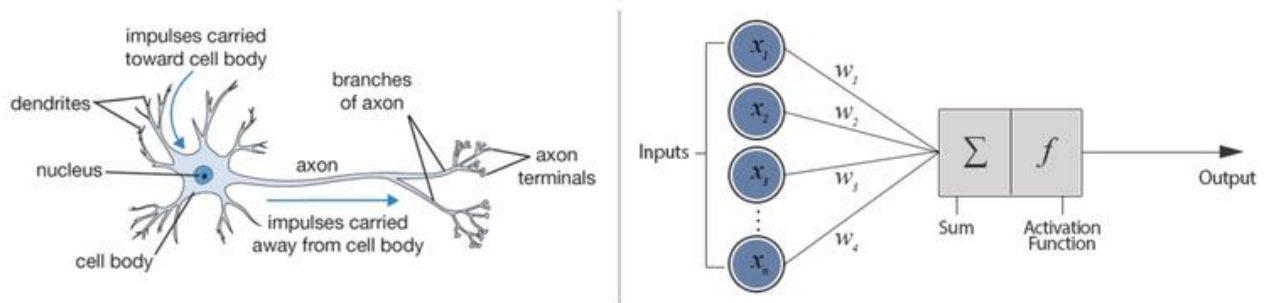


Neural networks

- Neural networks are a type of machine learning algorithm that is modeled to the human brain.
- Neural networks are composed of layers of interconnected nodes, each node representing a neuron in the brain.
- The nodes are connected by weights, which represent the strength of the connection between neurons.
- The network is trained using a set of input data and required output values, and then it can be used to make predictions or decisions based on new input data.
- Neural networks have been used for a variety of applications, including image recognition, natural language processing, and autonomous driving.
- The brain consists of a densely interconnected set of nerve cells, or basic information processing units, called neurons.

Biological Neuron versus Artificial Neural Network



machine learning algorithm

- Machine learning is a field of artificial intelligence that uses algorithms to learn from data, To find patterns, and make decisions without being explicitly programmed.
- Machine learning is a Science of Computer programing So that learn From Data.
- A computer program is said to learn from experience (E) with respect to some task (T) and some performance measure (P), if its performance on (T), as measured by (P), improves with experience (E).
- It focuses on the development of computer programs that can access data and use it to learn for themselves.

- **classification of Types machine Learning according (Supervision).**

- **(1). Supervised Learning.**

- ✓ **Classification.**

- ⇒ In a classification problem data is labelled into one of two or more classes.
- ⇒ Classification is a type of supervised machine learning algorithm that is used to predict a categorical label. It is used to identify to which category an item belongs to.
- ⇒ For example, a classification algorithm can be used to classify an email as spam or not spam.

- ✓ **Regression.**

- ⇒ Regression is a type of supervised machine learning algorithm that is used to predict a continuous value.
- ⇒ It is used to predict the value of a dependent variable based on one or more independent variables.
- ⇒ For example, Predicting the price of a stock over a period of time is a regression problem.

- **(2). Unsupervised Learning.**

- ✓ **Clustering.**

- ⇒ It is an unsupervised learning technique used to Find patterns and group similar data points together.
- ⇒ Clustering is the process of grouping data points into clusters based on their similarity.

- ✓ **Association Rule Learning.**

- ⇒ Association rule learning is a type of unsupervised learning algorithm that discovers interesting relationships between variables in large datasets.
- ⇒ It is used to find associations between items in dataset.

- ✓ **Dimensionality Reduction**

- ⇒ Dimensionality reduction is the process of reducing the number of features or dimensions in a dataset while preserving important information.
- ⇒ It is used to reduce the complexity of a dataset and make it easier to analyze and interpret.

➤ (3). *Semi Supervised Learning.*

➤ (4). *Reinforcement Learning*

Notes:

- ***Supervised Learning:***

- *Supervised learning is a type of machine learning algorithm that uses a **known dataset (labeled data) to make predictions.***
- *It uses input data and known responses to the data (labels) to learn a function that can predict the output for new data.*

- ***Unsupervised Learning:***

- *Unsupervised learning is a type of machine learning algorithm that **does not use labeled data.***
- *Instead, it uses input data and tries to find patterns and relationships in the data without any prior knowledge or labels.*

- ***Semi-Supervised Learning:***

- *Semi-supervised learning is a type of machine learning algorithm that combines supervised and unsupervised techniques.*
- *It **uses both labeled and unlabeled data to learn from the dataset.***

- ***Reinforcement Learning:***

- *Reinforcement learning is a type of machine learning algorithm **that learns by trial and error.***
- *It interacts with its environment by producing actions and **discovers errors or rewards.***

The goal is to maximize the cumulative reward over many trials.

neural network supervised or unsupervised learning why?

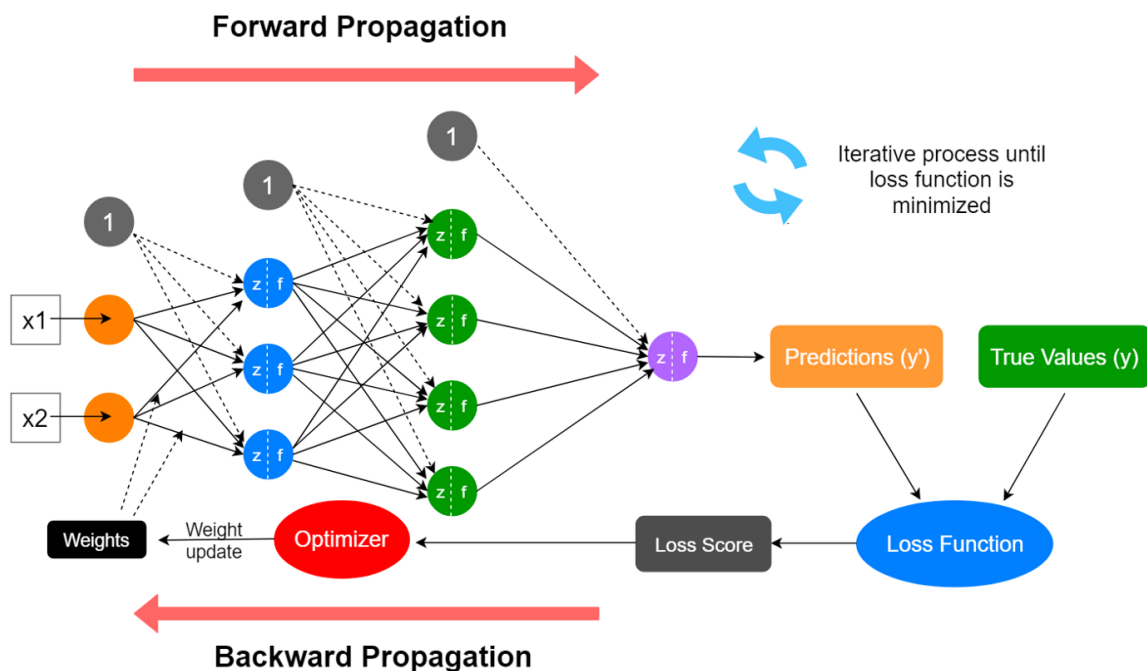
- Neural networks can be used for **supervised** learning tasks such as **classification** and **regression**.
- Neural networks can be used for **unsupervised** learning tasks such as **clustering** and **dimensionality reduction**.

neural network supervised

- A neural network is said to learn supervised, if the required output is already known.
- While learning, one of the input patterns is given to the net's input layer
- **Highly accurate.**

neural network unsupervised

- A Neural network that Learn unsupervised have no such target outputs.
- It can't be determined what the result of the learning process will look like.
- **Less accurate.**



"Forward propagation process"

- ⇒ process of passing inputs through a neural network and computing an output.
- ⇒ It involves multiplying each input by its corresponding weight and then summing up all these weighted inputs to get an output.

"Backward propagation process"

- ⇒ process of Edit weights in a neural network by calculating the gradient of the loss function with respect to the weights.
- ⇒ It is used to optimize the weights in a neural network so that it can better predict outputs given inputs.

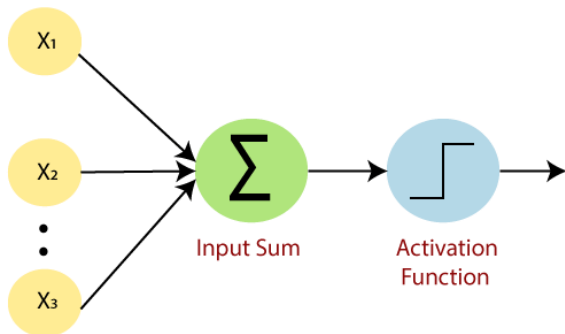
“Activation function”

- non-linear mathematical function used in artificial neural networks to determine the output of a neuron given an input or set of inputs.
- The purpose of the activation function is to introduce non-linearity into the network, allowing it to learn more complex functions.
- Commonly used activation functions include RELU, and Soft max.

“Neural network Types”

Single Layer Neural Network

- A single layer neural network is a basic type of neural network that consists of only one layer of neurons.
- It is the simplest type of artificial neural network and is used for basic classification tasks.
- It takes input data, assigns weights to each input, and then produces an output.



Multi Layer Neural Network

- A multi layer neural network is a more complex type of artificial neural network that consists of multiple layers of neurons.
- It can be used for more complex classification tasks and can learn more complex patterns in data than a single layer neural network.
- The multiple layers allow the network to learn more complex features from the data and make better predictions.

