NEURAL NETWORK

A neural network is a method in artificial intelligence that teaches computers to process data in a way that is inspired by the human brain. It is a type of machine learning process, called deep learning, that uses interconnected nodes or neurons in a layered structure that resembles the human brain.

Neural networks can help computers make intelligent decisions with limited human assistance. This is because they can learn and model the relationships between input and output data that are nonlinear and complex.

Applications of neural networks

Computer vision - Computer vision is the ability of computers to extract information and insights from images and videos. With neural networks, computers can distinguish and recognize images similar to humans.

Speech recognition - Neural networks can analyze human speech despite varying speech patterns, pitch, tone, language, and accent. Virtual assistants like Amazon Alexa and automatic transcription software use speech recognition to do tasks like this.

Natural language processing - Natural language processing (NLP) is the ability to process natural, human-created text. Neural networks help computers gather insights and meaning from text data and documents.

Working of neural networks

Input Layer: Receives input features.

Hidden Layers: Process information through weighted connections.

Output Layer: Produces the final result.

Weights and Biases: Adjusted during training to optimize the model.

Types of Neural Networks

Feedforward Neural Networks (FNN): Information flows in one direction.

Recurrent Neural Networks (RNN): Incorporate feedback loops for sequential data.

Convolutional Neural Networks (CNN): Specialized for image and spatial data.

Generative Adversarial Networks (GAN): Generate new data samples.

Training Neural Networks

Neural network training is the process of teaching a neural network to perform a task. Neural networks learn by initially processing several large sets of labeled or unlabeled data. By using these examples, they can then process unknown inputs more accurately.

- Loss Function: Measures the model's performance by comparing predicted values to actual values.
- Backpropagation: Adjusts weights and biases in the network to minimize the loss.
- Optimizers: Algorithms like Gradient Descent and its variants are used to find the optimal weights.

Deep Learning

Deep learning is a subset of machine learning that involves neural networks with multiple layers. It excels at automatically learning hierarchical representations from data.

In deep learning, the data scientist gives only raw data to the software. The deep learning network derives the features by itself and learns more independently. It can analyze unstructured datasets like text documents, identify which data attributes to prioritize, and solve more complex problems.