ASSIGNMENT – 1

Question 1.) What is Deep Learning?

Ans. Deep learning is a subset of Machine Learning that uses multilayer neural network, called deep neural networks, to simulate the complex decision-making power of the human brain. Some form of deep learning powers most of the Artificial Intelligence applications in our lives today.

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 amounts of unstructured data.

**How Deep Learning Works: -**

Neural Network consists of layers of interconnected 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 nonlinear transformations, allowing the model to learn intricate representations of the data.

In a deep neural network, the input layer receives data, which passes through hidden layers that transform the data using nonlinear functions. The final output layer generates the model’s prediction.

Question 2.) What is Neural Network and its types?

Ans. Neural networks are computational models that mimic the way biological neural networks in the human brain process information. They consist of layers of neurons that transform the input data into meaningful outputs through a series of mathematical operations. These models consist of interconnected nodes or neurons that process data, learn patterns, and enable tasks such as pattern recognition and decision-making.

Neural networks are capable of learning and identifying patterns directly from data without pre-defined rules. These networks are built from several key components:

1. **Neurons**: The basic units that receive inputs, each neuron is governed by a threshold and an activation function.
2. **Connections**: Links between neurons that carry information, regulated by weights and biases.
3. **Weights and Biases**: These parameters determine the strength and influence of connections.
4. **Propagation Functions**: Mechanisms that help process and transfer data across layers of neurons.
5. **Learning Rule**: The method that adjusts weights and biases over time to improve accuracy.

**The Different types of Neural Network are: -**

**1.** Convolutional Neural Networks (CNNs)

Convolutional Neural Networks structure is focused on processing the grid type data like images and videos by using convolutional layers filtering driving the patterns and spatial hierarchies.

* Key Components: Utilizing convolutional layers, pooling layers and fully connected layers.
* Applications: Used for classification of images, object detection, medical imaging analyses, autonomous driving and visualization in augmented reality.

**2.** Recurrent Neural Networks (RNNs)

Recurrent Neural Networks handles sequential data in which the current output is a result of previous inputs by looping over themselves to hold internal state (memory).

* Architecture: Contains recurrent connections that enable feedback loops for processing sequences.
* Applications: Language translation, open-ended text classification, ones to one’s interaction, and time series prediction are its applications.

**3.** Artificial Neural Network (ANNs)

Artificial Neural Networks are computing systems inspired by the biological neural networks in human brains. They consist of layers of interconnected nodes (neurons) that can learn complex patterns from data through training.

* **Architecture**: Consists of an input layer, one or more hidden layers, and an output layer. Each neuron in a layer is connected to neurons in the next layer with associated weights and activation functions that introduce non-linearity.
* **Applications**: Image and speech recognition, spam detection, recommendation systems, credit scoring, and medical diagnosis.

Question 3.) What is CNN in simple words?

Ans.Convolutional Neural Networks (CNNs) are a specialized class of neural networks designed to process grid-like data, such as images. They are particularly well-suited for image recognition and processing tasks.

They are inspired by the visual processing mechanisms in the human brain, CNNs excel at capturing hierarchical patterns and spatial dependencies within image.