**1.What is DL (Deep Learning)?**

Ans :- Deep Learning (DL) is a subset of Machine Learning that involves the use of algorithms known as artificial neural networks. These networks are inspired by the structure and function of the human brain and are designed to recognize patterns from large amounts of data. Deep Learning models automatically extract features from raw input data through multiple layers of abstraction, making them highly effective for tasks like image classification, natural language processing, speech recognition, and autonomous driving. Unlike traditional machine learning, DL minimizes the need for manual feature extraction and improves as more data is provided.

**2.** **What is a Neural Network and its Types?**

Ans :- A Neural Network is a computational model that is inspired by the way biological neural networks in the human brain process information. It consists of layers of interconnected nodes (also called neurons), where each connection has a weight that gets adjusted during training.

Artificial Neural Network (ANN):

(ANN), is a group of multiple perceptrons or neurons at each layer. ANN is also known as a Feed-Forward Neural network because inputs are processed only in the forward direction. This type of neural networks are one of the simplest variants of neural networks. They pass information in one direction, through various input nodes, until it makes it to the output node. The network may or may not have hidden node layers, making their functioning more interpretable.

Advantages:

* Storing information on the entire network.
* Ability to work with incomplete knowledge.
* Having fault tolerance.
* Having a distributed memory.

Disadvantages:

* Hardware dependence.
* Unexplained behavior of the network.
* Determination of proper network structure.

Convolutional Neural Network (CNN):

(CNN) are one of the most popular models used today. This neural network computational model uses a variation of multilayer perceptrons and contains one or more convolutional layers that can be either entirely connected or pooled. These convolutional layers create feature maps that record a region of image which is ultimately broken into rectangles and sent out for nonlinear processing.

Advantages:

* Very High accuracy in image recognition problems.
* Automatically detects the important features without any human supervision.
* Weight sharing.

Disadvantages:

* CNN do not encode the position and orientation of object.
* Lack of ability to be spatially invariant to the input data.
* Lots of training data is required.

Recurrent Neural Network (RNN):

(RNN) are more complex. They save the output of processing nodes and feed the result back into the model (they did not pass the information in one direction only). This is how the model is said to learn to predict the outcome of a layer. Each node in the RNN model acts as a memory cell, continuing the computation and implementation of operations. If the network’s prediction is incorrect, then the system self-learns and continues working towards the correct prediction during backpropagation.

Advantages:

* An RNN remembers each and every information through time. It is useful in time series prediction only because of the feature to remember previous inputs as well. This is called Long Short Term Memory.
* Recurrent neural network are even used with convolutional layers to extend the effective pixel neighborhood.

Disadvantages:

* Gradient vanishing and exploding problems.
* Training an RNN is a very difficult task.
* It cannot process very long sequences if using tanh or relu as an activation function.

**3.** **What is CNN in Simple Words?**

Ans:- A Convolutional Neural Network (CNN) is a deep learning model used mostly for analyzing visual data. It automatically learns to detect important features such as edges, textures, or shapes from raw images using convolutional layers. Each layer applies filters (kernels) to extract different features, reducing the need for manual feature engineering. CNNs are widely used in image classification, object detection, facial recognition, and more.

**4.** **Short Notes About the Pipeline**

Ans:- A general Deep Learning pipeline consists of the following steps:

1. Data Collection:- Gather a large dataset relevant to the problem (e.g., images, text, audio).

2. Data Preprocessing:- Clean and prepare the data. - Includes resizing images, normalizing values, and data augmentation.

3. Model Design: - Select or design a neural network architecture suited to the task. - Example: Use CNN for image-related tasks.

4. Training the Model: - Feed data to the model. - Use optimization algorithms like SGD or Adam to minimize error. - Adjust weights based on loss using backpropagation.

5. Model Evaluation:- Test the model on a separate validation/test dataset. - Metrics like accuracy, precision, and recall are used.

6. Deployment:- Integrate the trained model into an application. - Use it to make predictions on new, unseen data.