***Week-1 Assignment***

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

Deep Learning is a subfield of machine learning that uses artificial neural networks with multiple layers to learn from large amounts of data. It mimics how the human brain works to solve complex tasks like image recognition, speech processing, and natural language understanding.

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

A Neural Network is a computational model inspired by the human brain, made up of layers of interconnected nodes (neurons). Each node processes input data and passes the result to the next layer.

Types of Neural Networks:

1. Feedforward Neural Network (FNN)
   * Data flows in one direction, from input to output.
   * Used for simple classification tasks.
2. Convolutional Neural Network (CNN)
   * Best for image data.
   * Uses convolution layers to detect spatial features.
3. Recurrent Neural Network (RNN)
   * Designed for sequence data (e.g., time series, text).
   * Has loops to remember previous outputs.
4. Generative Adversarial Network (GAN)
   * Has two networks (generator and discriminator) competing against each other.
   * Used for generating new data (like fake images).
5. Autoencoders
   * Used for data compression and reconstruction.
   * Common in noise reduction and anomaly detection.

**What is CNN (Convolutional Neural Network) in Simple Words?**

A CNN is a special type of neural network used mainly for images. Instead of just looking at individual pixels, it learns patterns like edges, shapes, and textures.  
It uses filters (called kernels) to scan images and detect important features. This makes CNNs very good at tasks like face recognition, object detection, and medical image analysis.

**Deep Learning Pipeline**

1. Data Collection :

* Gather images, text, audio, etc. for training.
* Ensure quality and quantity.

2. Data Preprocessing :

* Normalize/scale the data.
* Resize images, tokenize text, remove noise, etc.
* Split into training, validation, and test sets.

3. Model Building :

* Choose an architecture (e.g., CNN, RNN).
* Define layers and activation functions.

4. Model Training :

* Feed training data to the model.
* Use loss function and optimizer (e.g., Adam, SGD).
* Monitor performance with metrics like accuracy or loss.

5. Model Evaluation :

* Test model on unseen data.
* Use validation/test accuracy, confusion matrix, etc.

6. Hyperparameter Tuning :

* Adjust learning rate, batch size, number of layers, etc.
* Use Grid Search or Random Search.

7. Deployment (Optional) :

* Convert model to ONNX, TensorFlow Lite, etc.
* Integrate into an application or website.