# Week 1 Assignment

## Project: Forest Fire Detection Using Deep Learning

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

Deep Learning is a subset of Machine Learning that uses artificial neural networks with multiple layers to model complex patterns in data. It mimics the structure and function of the human brain to process data and create patterns used in decision making. DL is particularly effective for tasks such as image recognition, speech processing, and natural language understanding.

### 2. What is CNN (Convolutional Neural Network)?

CNN, or Convolutional Neural Network, is a class of deep neural networks primarily used for analyzing visual imagery. It consists of layers like convolutional layers, pooling layers, and fully connected layers. CNNs are widely used in image classification, object detection, and facial recognition tasks due to their ability to automatically and adaptively learn spatial hierarchies of features from input images.

### 3. Different Types of Neural Networks

1. Feedforward Neural Networks (FNN)  
 - Basic type of neural network where the information moves in only one direction—from input to output.

2. Convolutional Neural Networks (CNN)  
 - Specialized for processing structured grid data like images.

3. Recurrent Neural Networks (RNN)  
 - Designed for sequence prediction tasks like time series or language modeling.

4. Generative Adversarial Networks (GAN)  
 - Consists of two networks (generator and discriminator) competing with each other, used for image generation and enhancement.

5. Autoencoders  
 - Used for unsupervised learning and dimensionality reduction by encoding and decoding the input.

### 4. Project Pipeline – Forest Fire Detection System

Step 1: Problem Definition  
Design a system that detects forest fires from images and classifies them into two categories: 'fire' and 'nofire'.

Step 2: Dataset Acquisition and Preprocessing  
- Collect images from a public dataset containing forest fire and no-fire images.  
- Resize all images to a standard resolution for uniformity.  
- Normalize pixel values to improve model performance.

Step 3: Model Building using CNN  
- Build a Convolutional Neural Network model.  
- Use layers such as Conv2D, MaxPooling2D, Flatten, Dense, and Dropout.  
- Compile the model with an appropriate loss function and optimizer.

Step 4: Training and Validation  
- Split the dataset into training and validation sets.  
- Train the CNN model and monitor performance using metrics like accuracy and loss.

Step 5: Evaluation and Testing  
- Evaluate the model on unseen data.  
- Calculate precision, recall, and confusion matrix.

Step 6: Deployment  
- Deploy the model using a web framework like Flask or Django.  
- Create an interface where users can upload an image and receive predictions.

### Conclusion

This project lays the foundation for an AI-based forest fire detection system that could assist in real-time monitoring and disaster management. Using deep learning and CNNs enhances the capability of early detection, potentially saving lives and reducing environmental impact.