**Week 1 - Forest Fire Detection using Deep Learning (CNN)**

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

Deep Learning is a subfield of Machine Learning that uses algorithms inspired by the structure and function of the human brain called artificial neural networks. It is especially powerful for working with unstructured data like images, audio, and text. In our project, we use Deep Learning to automatically detect forest fires using image data.

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

A Neural Network is a system of algorithms that attempts to recognize relationships in data through a process that mimics the way the human brain operates. It consists of layers of nodes (neurons), including input, hidden, and output layers.

**Types of Neural Networks:**

* **Feedforward Neural Network (FNN)**: The most basic type where the data flows in one direction.
* **Convolutional Neural Network (CNN)**: Best for image data, detects patterns like edges, textures.
* **Recurrent Neural Network (RNN)**: Useful for sequential data like time series or text.
* **Generative Adversarial Network (GAN)**: Generates new data based on training data.

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

CNN, or Convolutional Neural Network, is a type of neural network especially used for image data. It automatically learns features like edges, shapes, and textures from the images. In simple terms, CNN looks at different parts of the image to understand what it represents and helps in tasks like image classification and object detection.

In our project, CNN is used to detect whether an image shows signs of a forest fire (binary classification: fire or no fire).

**4. Short Notes on the Pipeline Discussed in Class**

**Step 1: Data Collection & Data Loading**

* We collect forest fire images from platforms like **Kaggle**.
* The data is loaded into **Google Colab** for processing.

**Step 2: Image Processing & Augmentation**

* All images are resized to **129x129 pixels** for uniformity.
* **Image Augmentation** is applied (rotation, zoom, flip, etc.) to artificially expand the dataset and make the model robust.

**Step 3: Build CNN Model**

* A **CNN model** is built using **TensorFlow** and **Keras**.
* The model is trained on the preprocessed images.

**Step 4: Training, Validation, Testing**

* The dataset is split into **training**, **validation**, and **testing** sets.
* Training teaches the model to identify fire features.
* Validation helps to tune the model.
* Testing evaluates the model's accuracy on new images.

**Step 5: Evaluation**

* After training, the model is tested for performance.
* We check **accuracy** and other metrics to confirm whether the model predicts correctly.
* The final output is **binary** (Fire / No Fire).