**Forest Fire Detection Using Deep Learning**

**Week 1**

**1. What is Deep Learning (DL)?**  
Deep Learning is a subset of Machine Learning where computers learn from large amounts of data using special algorithms. These algorithms automatically learn to recognize patterns, make decisions, and improve over time without being explicitly programmed. Deep learning is widely used in tasks like image recognition, voice assistants, and self-driving cars.

**2. What is Neural Network and its types?**

A **Neural Network** is a **machine learning model** inspired by how the human brain works.  
It is made up of layers of **nodes (neurons)** where:

* Each node receives input, processes it, and passes it to the next layer.
* It learns patterns and relationships in data through **training**.

Neural Networks are the **core of Deep Learning** and can handle tasks like classification, prediction, and image recognition.

**Types of Neural Network**

1. **Artificial Neural Network (ANN)**

* Basic type of neural network.
* Works with structured/tabular data.
* Processes input through hidden layers to produce output.

Example: Predicting house prices, stock market trends, or fire risk levels using environmental data.

**2. Convolutional Neural Network (CNN)**

* Used mainly for image and video analysis.
* Recognizes patterns like edges, shapes, objects.
* Has convolutional and pooling layers.

Example: Detecting forest fires from satellite images, facial recognition, or medical image analysis.

**3. Recurrent Neural Network (RNN)**

* Used for **sequential or time-series** data.
* Remembers previous inputs (like memory).
* Often used in **Natural Language Processing (NLP)**.

**Example:** Predicting weather patterns, translating text, or analyzing forest fire trends over time.

**3. What is CNN in simple words?**A Convolutional Neural Network (CNN) is a type of deep learning model that can look at images, understand patterns like edges or shapes, and recognize objects. It’s commonly used for tasks like detecting faces, fire, or animals in pictures.

**4. Short Notes About the Pipeline**

The project pipeline for forest fire detection using deep learning involves the following steps:

1. **Data Collection & Loading:**
   * Data is collected from sources like Kaggle or Google Colab.
   * The dataset includes images categorized as “fire” or “no fire” (binary classification).
2. **Image Processing & Augmentation:**
   * Images are preprocessed to make them uniform in size (e.g., 179x179).
   * Augmentation techniques like rotation, flipping, etc., are applied to increase the dataset and improve model robustness.
3. **Build CNN Model:**
   * A Convolutional Neural Network (CNN) is created using TensorFlow or a similar framework.
   * The model is trained on the processed image dataset.
4. **Train-Validation-Test Split:**
   * Dataset is split into training, validation, and testing sets.
   * Training helps the model learn; validation fine-tunes parameters; testing checks final performance.
5. **Testing and Evaluation:**
   * Model is tested using unseen data.
   * Accuracy and evaluation metrics are used to validate model performance.