

WEEK 1 ASSESSMENT - FOREST FIRE DETECTION

Que 1. What is Deep Learning ?

Solu. Deep Learning is a type of Machine Learning that teaches computers to learn from data using structures called artificial neural networks, which are inspired by the human brain. These networks are made up of layers of "neurons" that work together to recognize patterns and make decisions.

Deep Learning is especially good at handling large amounts of complex data, such as images, audio, video, and text. For example, it is used in facial recognition, speech assistants like Siri or Alexa, self-driving cars, and even in medical diagnosis.

The "deep" in Deep Learning refers to the many layers in the neural network. Each layer learns different features of the data. The more layers there are, the better the system can understand and learn from the data.

In short, Deep Learning helps computers get better at solving difficult problems by learning from experience, just like humans do.

Que 2. What is Neural networks and its types?

Solu. A Neural Network is a computer system designed to work like the human brain. It is made up of layers of small units called neurons that process information. These neurons are connected to each other and pass information forward, helping the system to learn from data. Each neuron takes input, does some calculations, and passes the result to the next layer. By doing this again and again, the network learns how to make decisions — like recognizing a face in a photo or understanding handwriting.

Types of Neural networks :

1. Feedforward Neural Network (FNN):

- This is the most basic type of neural network.
- Information moves in one direction — from input to output — without going backward.
- It is mainly used for simple tasks like classification (e.g., is an email spam or not?) and prediction (e.g., house price prediction).

2. Convolutional Neural Network (CNN):

- Specially designed for working with images and videos.
- It uses filters to automatically detect patterns like edges, textures, or shapes.
- Very useful in tasks like facial recognition, object detection, and medical image analysis.

3. Recurrent Neural Network (RNN):

- Best for handling data that comes in sequences (like sentences or time-series data).
- It remembers past inputs using loops in the network, which helps it understand context.

- Commonly used in language translation, voice recognition, and predicting future values like stock prices.
4. Generative Adversarial Network (GAN):
 - Made of two networks: a generator (that creates fake data) and a discriminator (that checks if data is real or fake).
 - They compete with each other, which helps the generator improve its output.
 - Used for creating realistic images, artwork, deepfakes, and even music.
 5. Radial Basis Function Network (RBF):
 - Uses a mathematical function that depends on the distance between points.
 - Good for pattern recognition and function approximation.
 - Works well when the data points are close to specific centers or clusters.

Que 3. What is CNN?

Solu. A Convolutional Neural Network (CNN) is a type of deep learning model particularly effective for processing grid-like data like images and videos. It is designed to automatically learn patterns, shapes, colors, and features from visual data.

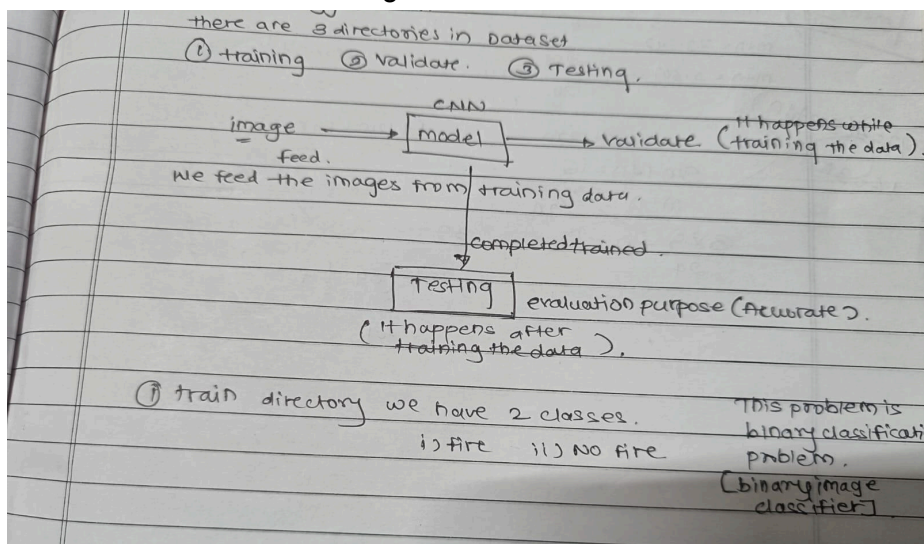
Imagine you're trying to recognize a cat in a photo — instead of telling the computer what a cat looks like (with eyes, ears, etc.), a CNN learns those features by itself from many examples.

Que 4. Create a short note about the pipeline .

Solu. Project Pipeline :

1. Data Collection and Data Loading :

- The data is loaded from Kaggle or another dataset source.
- The dataset Consists of 3 directories :
 - I. Training
 - II. Validation
 - III. Testing



2. Image Preprocessing / Augmentation :

- Preprocessing steps include:
 - I. Resizing images to a fixed size (for uniformity).
 - II. Normalizing pixel values.
- **Augmentation**: Techniques like rotation, flipping, zooming, etc., to artificially increase the size and variability of the dataset. This helps the model generalize better.

3. Build CNN Model :

- A CNN architecture is defined using layers such as:
 - I. Convolutional Layers (for feature extraction),
 - II. Pooling Layers (for downsampling),
 - III. Dense Layers (for classification).
- The model is compiled with an appropriate **loss function**, **optimizer**, and **metrics** (e.g., accuracy).

4. Train CNN Model and Test :

- The model is trained on the training dataset.
- The training process involves feeding input images and adjusting the model weights to minimize the loss function.
- Once training is complete, the model is tested on unseen data (test set). The goal is to evaluate the final performance using metrics such as accuracy, precision, recall, or F1 score.