**Assignment No: 3**

**Problem Statement:**

Develop an image classification system using Convolutional Neural Networks (CNNs) for multiclass classification.

**Theory:**

A Convolutional Neural Network (CNN) is a deep learning architecture optimized for analyzing structured grid data, such as images. CNNs are widely used in tasks like image classification and object recognition.

* Convolutional Layers: These layers extract features by applying filters to the input image.
* Pooling Layers: Pooling layers reduce the spatial dimensions of the feature maps to simplify computations.
* Fully Connected Layers: These layers perform the final classification based on the extracted features.

**Methodology:**

1. Dataset:
   * Use a dataset like CIFAR-10, which contains 60,000 32x32 color images across 10 distinct classes.
2. Model Architecture:
   * Build a CNN consisting of multiple convolutional layers followed by max-pooling layers to progressively extract features.
   * Use the ReLU activation function in the convolutional layers and Softmax activation in the output layer for multiclass classification.
3. Training:
   * Train the model using an optimizer like Adam and a loss function such as categorical\_crossentropy.
   * Apply data augmentation techniques (e.g., random rotations, flips) to improve generalization.
4. Evaluation:
   * Assess the model's performance on the test dataset using metrics like accuracy, precision, and recall.

**Conclusion:**

We successfully implemented a CNN for multiclass image classification using the CIFAR-10 dataset, achieving high accuracy in distinguishing between various image categories**.**