CST 476-2 Deep Learning

Lab Sheet 06

Activity: Image Classification with CIFAR-10 Using CNNs

Aim:

The aim of this lab session is to implement a CNN for classifying images from the CIFAR-10 dataset.

Dataset:

CIFAR-10 Dataset

Description of the Dataset:

The CIFAR-10 dataset is a widely used benchmark for image classification tasks, consisting of 60,000 32x32 color images divided into 10 distinct classes. Each class represents a category such as airplanes, automobiles, birds, cats, deer, dogs, frogs, horses, ships, and trucks. The dataset is pre-split into 50,000 training images and 10,000 test images, with each image evenly distributed across the 10 classes.

Tasks:

- Load the dataset directly using TensorFlow.
- Open your Jupyter Notebook environment and import the necessary libraries.
- Load the train, validation, and test datasets into your Jupyter Notebook environment using a suitable approach.
- Normalize the pixel values of the images to improve the model's training performance.
- Design a CNN architecture for multi-class classification, ensuring the use of appropriate layers.
- Compile the model, specifying the optimizer and loss function.
- Train the model using the training dataset.
- Evaluate the model's performance on the test dataset.
- Predict provided unseen data to apply the model to real-world use.
- Experiment with model training by changing the number of layers, number of filters, architecture, activation function, adjusting the learning rate, changing other hyperparameters, etc.