Ex No:-4

14/08/25 Simple Feed Forward Neural Network

Aim:

To design, implement, and train a feed-forward neural network using the MNIST dataset to recognize handwritten digits (0-9)

Objective:

1, To Understand the architecture of a Simple feed-forward netural network.
2, To PreProcess image data for neural network training.
3, To implement the network using dense layers in TensorFlow/Keras.
4, To train and evaluate the model for digit classification accuracy.
5, To analyze model Performece using test data

Problem Statement:

Develop a neural network that Can Correctly Classify grayscale handwritten digit images from the MNIST dataset into one of ten Categories (0-9).

Pseudocode:-

→ Import required libraries (TensorFlow, Keras)
→ Load MNIST data set (Training and Testing sets)
→ Normalize Pixel Values to range (0,1)
→ ONE-HOT encode output label
→ Initialize Sequential model
→ ADD Flatten layer to Convert 28X28 input to 1D Vector.
→ ADD dense layer with 128 Neurons, ReLU activation
→ ADD dense layer with 64 neurons, ReLU activation
→ ADD dense output layer with 10 neurons, Softmax activation.
→ Compile model with Adam optimizer, Categorical Crossentropy Loss.
→ Train model on training set for 5 epochs with Validation Split
→ Evaluation model on test Set
→ Display test accuracy
→ Predict class for Sample test images.

Observations:-

1, The training accuracy increased steadly over epoches.
2, Validation accuracy closely matched training accuracy, indicating minimal overfitting.
3, The network achieved high accuracy with one dense layer, without convolution.
4, Normalizing input data improved convergence

=> Accuracy of the Network = 97.47%

Result:-

Succefully Implemented Simple Feed Forward Neural Network.

=> Epoch [1/5], step [600/600], Loss: 0.2258

=> Epoch [2/5], step [600/600], Loss: 0.1615

=> Epoch [3/5], step [600/600], Loss: 0.1631

=> Epoch [4/5], step [600, 600], Loss: 0.0660

=> Epoch [5/5], step [600,600], Loss: 0.0636.