Practical No:- 4.

Aim:- Training Deep Neural Network for Regression
& classification tasks.

Objectives:-

(1) To understand the structure and working of
deep neural networks.

(2) To train DNN models for solving regression
& classification problems.

Theory:-

- Deep Neural Networks (DNN's) are an advanced
type of Artificial Neural Network that consist
of Multiple hidden layers between the input
and output.

- Each layer consists of multiple neurons that are
responsible for learning specific features from the
data.

- These models are capable of handling complex tasks
due to their ability to learn non-linear and
hierarchical representations.

The two main types of problems that DNNs can
solve are Regression & classification.

- Regression is a type of supervised learning where the output is a continous value.
For instance, predicting temperature, stock prices, or house prices are regression problems.
- In such cases, DNN's learn to approximate a function that maps input features to continous outputm.
- The final layer typically uses a linear activation function, and the model is evaluated using metrics like Mean Square Error (MSE) and Root Mean Squared Error (RMSE)

\# Classification, on the other hand involves predicting discrete class labels.
- It can be binary (eg. spam or not spam), or multi-class (eg. classifying animals in an image as cat, dog, or horse)
- For classification tasks, the final layer of the DNN uses an activation function such as sigmoid (for binary) or softmax (for multiclass) and evaluation metrics include accuracy, precision, recall, and F1-score.

key components of a Deep Neural Network includes:

- Input layer- receives raw data.
- Hidden layers - extracts features & patterns.
- Output layer - provides final prediction.
- Activation functions - introduce non-linearity
  (eg:-ReLU, Sigmoid, tanH)
- loss Function - measures the difference between predicted and actual output.
- Optimizer - updates weights to minimize loss.
  (eg:- Adam, SGD)

Conclusion:-
Deep Neural Networks are powerful models capable of solving both regression & classification problems efficitively. With proper training & tuning they can archive high accuracy and performance across a wide range of real-world tasks.