**Neural Network Laboratory**

1. WAP to implement a Perceptron using numpy in Python.
2. WAP to implement the Gradient Descent algorithm for perceptron learning using numpy and Pandas.
3. WAP to evaluate the performance of perceptron with linear and sigmoid activation functions for a regression and binary classification problem respectively.
4. WAP to train and evaluate a three-layer neural network using Tensor flow library to classify MNIST handwritten digits dataset.
5. WAP to train and evaluate a convolutional neural network using Keras Library to classify MNIST fashion dataset. Demonstrate the effect of filter size, regularization, batch size and optimization algorithm on model performance.
6. WAP to train and evaluate a Recurrent Neural Network to predict the next value in a sample time series dataset.
7. WAP to retrain a pretrained imagenet model to classify a medical image dataset.

**Mini Project 1:** Build an image dataset that contains grayscale images of leaves of various plants/trees growing in MBMU campus. Perform necessary preprocessing steps to make the dataset uniform and ready for training. Train a deep autoencoder network that can reproduce any random image of a leaf from MBMU campus.

**Bonus:** Can we use this network to identify if a leaf is from MBM Campus or not?

**Mini Project 2:** Create an Android App that captures the readings from motion sensors (accelerometer and gyroscope) in an android phone. Build a dataset using this application that contains the motion characteristics of an average person driving a two-wheeler. Build a LSTM classifier that takes any 3 second sample as input and classifies it as Kankar Road, Bitumen Road, Concrete Road, Single Speed Breaker and Multiple Speed Breakers.

**Bonus:** Can we use this dataset to generate alerts when a person is rash driving?

**Mini Project 3:** Build a Video Dataset that contains short videos (max. 5 seconds) of students performing Yogasanas (atleast 6 asanas) with diverse backgrounds, ambient lighting and clothes. Train a CNN that can identify the asana being performed in the video.

**Bonus:** Can we further rate the asana pose as Good, Average and Poor?

**Sample Datasets:**

1. <https://www.kaggle.com/c/titanic>
2. <https://www.kaggle.com/datasets/uciml/pima-indians-diabetes-database>
3. <https://www.kaggle.com/datasets/fedesoriano/wind-speed-prediction-dataset>
4. <https://www.kaggle.com/datasets/shivam2503/diamonds>
5. <https://www.kaggle.com/c/web-traffic-time-series-forecasting/data>

**Important Instructions:**

1. You may refer Kaggle website for more suitable datasets other than these datasets.
2. You need to opt any one out of three mini projects. You can work in group of four students. All groups working on a project can collaborate together for dataset creation. Submit details of your group latest by 12 Jan 2025.
3. Create a public GitHub repository with repository name set as <ROLLNO>-<Name>-<NNLAB>-2025. For each experiment create a new folder containing source code files, dataset (split into train and test), doc file containing information about hyperparameters, network architecture, training accuracy, test accuracy, confusion matrix (if applicable), training loss curve (if applicable). Fill the repository URL in this form latest by 15-01-2025: <https://forms.gle/59VDphb8ExnZpJn38>
4. You have to achieve an accuracy of atleast 85% for project acceptance.

**Submission Deadlines:**

1. Exp. 1 to 3: 01 Feb 2025
2. Exp. 4: 08 Feb 2025
3. Exp. 5: 22 Feb 2025
4. Exp. 6: 08 Mar 2025
5. Exp.7: 22 Mar 2025
6. Minor Project:
   1. Dataset Strategy: 18 Jan 2025
   2. Dataset Collection & Compilation: 25 Jan 2025
   3. Dataset Labelling and Preprocessing: 08 Feb 2025
   4. Model Architecture: 22 Feb 2025
   5. Model Training: 08 Mar 2025
   6. Model Optimization & Comparison: 22 Mar 2025
   7. Bonus Evaluation: 19 Mar 2025
   8. Model Chart Review: 05 Apr 2025
   9. Model Chart Submission: 12 Apr 2025