Lab- 5

CSET340- Advanced Computer Vision and Video analytics

Task-1:- Perform image compression operation on an image.

Image compression reduces the size of image files while maintaining acceptable quality. The most common techniques include:

1. Lossless Compression- PNG (Portable Network Graphics), GIF (Graphics Interchange Format), TIFF (Tagged Image File Format), Run-Length Encoding (RLE), Huffman Coding, Lempel-Ziv-Welch (LZW).

2. Lossy Compression-JPEG (Joint Photographic Experts Group), WebP (Google's Image Format), Discrete Cosine Transform (DCT), Wavelet Transform (JPEG 2000), Principal Component Analysis (PCA) Based Compression

- **T 1.1:- Perform image compression using a lossy method like JPEG.**
- **T 1.2:- Perform image compression using a lossless method like PNG.**

Task-2:- Apply convolution neural networks (CNN)

- **Apply CNN and find the model accuracy with (80-20 train-test split) on the MNIST dataset.**
    - Results should be obtained on following parameters-
        - Accuracy
        - Precision (Positive Predictive Value)
        - Recall (Sensitivity)
        - F-Measure
        - Confusion Matrix
        - ROC
        - AUC
- **Apply CNN and find the model accuracy with (80-20 train-test split) on the CIFAR-10 dataset.**

About MNIST :-

- The MINST dataset stands for "*Modified National Institute of Standards and Technology*".
- The dataset contains a large collection of handwritten digits that is commonly used for training various image processing systems.
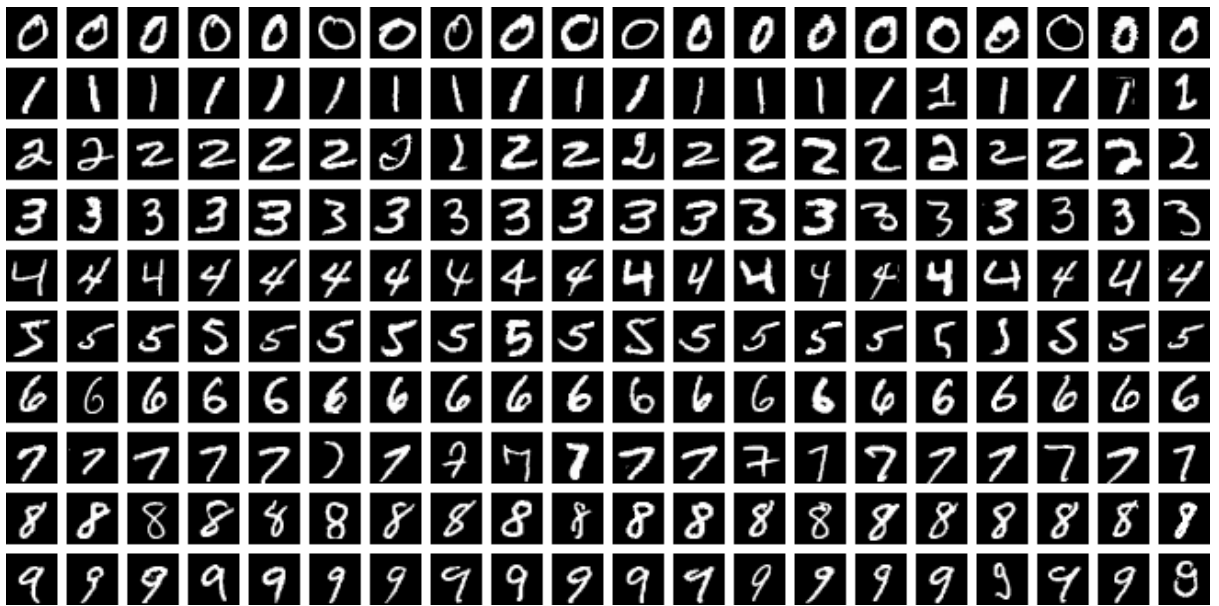
- The dataset was created by re-mixing samples from NIST's original datasets, which were taken from American Census Bureau employees and high school students.
- It contains 60,000 training images and 10,000 testing images, each of which is a grayscale image of size 28x28 pixels.
    - **Number of Instances:** 70,000 images
    - **Number of Attributes:** 784 (28x28 pixels)
    - **Target:** Column represents the digit (0-9) corresponding to the handwritten image
    - **Pixel 1-784:** Each pixel value (0-255) represents the grayscale intensity of the corresponding pixel in the image.
    - The dataset is divided into two main subsets:
        - **Training Set:** Consists of 60,000 images along with their labels, commonly used for training machine learning models.
        - **Test Set:** Contains 10,000 images with their corresponding labels, used for evaluating the performance of trained models.
- Link:- https://www.kaggle.com/datasets/hojjatk/mnist-dataset

About CIFAR-10:-

- (Canadian Institute For Advanced Research) describe the dataset:
- The CIFAR-10 dataset consists of 60,000 32 x 32 colour images in 10 classes, with 6,000 images per class. There are 50,000 training images and 10,000 test images.
- CIFAR-100 available in Keras that you can use for further practice. It has 100 classes. (optional)
- Shape of image from MNIST changed from (28, 28, 1) to (32, 32, 3) according to the size of the images.
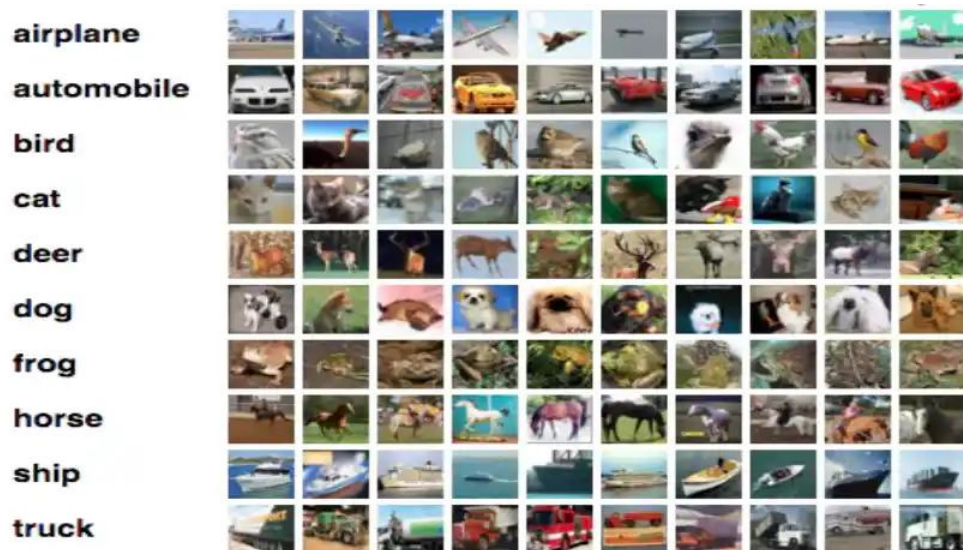
- Note:- Use keras or pytorch or tensorflow to perform CNN based operations.
  - Load the dataset in keras using '**from keras.datasets import mnist**'
  - Load the dataset in keras using '**from keras.datasets import cifar10**'
  - Minimum number of epochs should be 50.
  - Other **hyperparameters** can vary as per the models performance requirements.
  - Submission to be done on LMS as per instructions provided there.