# AssignmentNo. 3

## ProblemStatement:

Build the Image classification model by dividing the model into following 4 stages:

1. Loading and preprocessing the image data
2. Defining the model's architecture
3. Training the model
4. Estimating the model's performance

**Objective:**

1. To be able to apply deep learning algorithms to solve problems of moderate complexity
2. Understand how a model is trained and evaluated.
3. Classifying images from the image dataset.
4. Our main goal is to train a neural network (using Keras) to obtain > 90% accuracy on image dataset..
5. Toapplythealgorithmstoa real-worldproblem,optimizethemodelslearnedandreportonthe expectedaccuracy thatcanbeachieved byapplying themodels

**Outcomes:**

At the end of the assignment the students should able-

1. Learn and Use various Deep Learning tools and packages.
2. Build and train a deep Neural Network models for use in various applications.
3. Apply Deep Learning techniques like CNN, RNN Auto encoders to solve real word Problems.
4. Evaluate the performance of the model build using Deep Learning.

**Solution Expected**

Implement and train a Convulutional neural network (CNN) on an hand-written digits image dataset called MNIST  and improve model generalization by achieving increased accuracy and decreased loss where model gains good confidence with the prediction.

**Methodology to be used**

⮚ Deep Learning

⮚ Auto encoders

**Infrastructure:** Desktop/ laptop system with Linux /Ubuntu 16.04 or higher (64-bit)/ Windows OS/Mac OS

**Software used:** LINUX/ Windows OS/ Virtual Machine/ IOS, Anaconda distribution, Jupyter notebook, python 3.9.12

**Theory:**

Deep Learning has been proved that its a very powerful tool due to its ability to handle huge amounts of data. The use of hidden layers exceeds traditional techniques, especially for pattern recognition. One of the most popular Deep Neural Networks is Convolutional Neural Networks (CNN).

**Convolutional Neural Networks (CNNs)**

A convolutional neural network (CNN) is a type of Artificial Neural Network (ANN) used in image recognition and processing which is specially designed for processing data (pixels). The goal of a CNN is to learn higher-order features in the data via convolutions. They are well suited to object recognition with images and consistently top image classification competitions. They can identify faces, individuals, street signs, platypuses, and many other aspects of visual data. CNNs overlap with text analysis via optical character recognition, but they are also useful when analyzing words6 as discrete textual units.

## Conclusion:

## Thus, we have implemented the Image classification model using CNN. With above code we can see that sufficient accuracy has been met. Throughout the epochs, our model accuracy increases and loss decreases that is good since our model gains confidence with our prediction

## This indicates the model is trained in a good way

## The loss is decreasing and the accuracy is increasing with every epoch.

## The test accuracy is the measure of how good the model is predicting so, it is observed that the model is well trained after 10 epochs