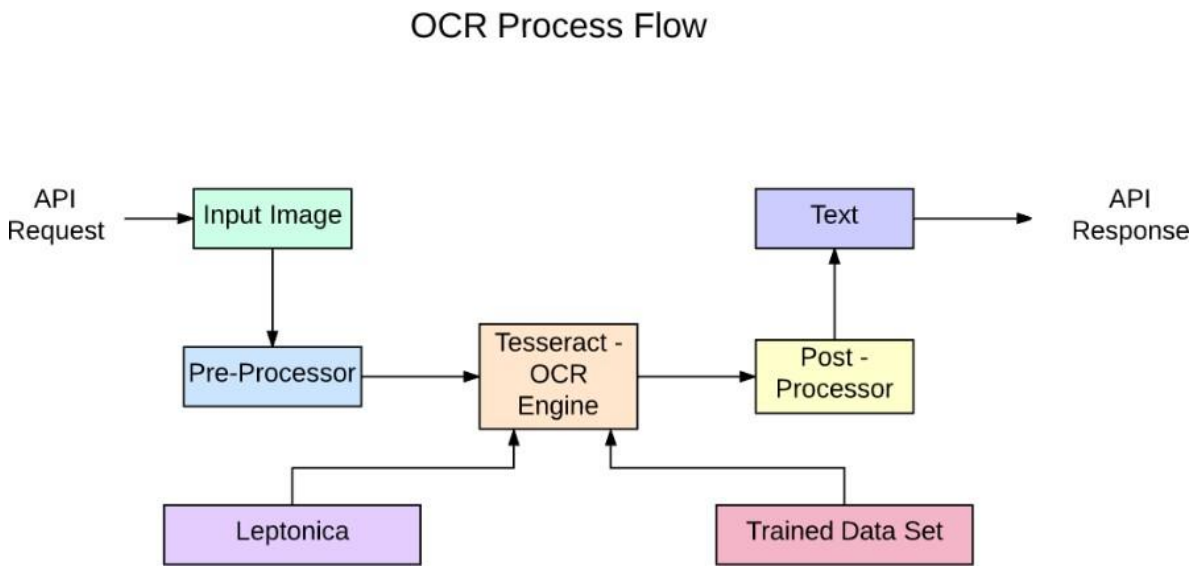
Project Design Phase-I
Solution Architecture

Date	24 September 2022
Team ID	PNT2022TMID36931
Project Name	Project - A Novel method for Handwritten Digit Recognition System
Maximum Marks	4 Marks

Flow Diagram:



Implementation:

The convolutional and max-pool layer: The feature is extracted from the input image and got max pooled to reduce the dimensionality of the image without any changes in the extracted feature.

The dense layer: The flattened output from the max-pool layer is fed to a feed-forward neural network and backpropagation applied to every iteration of training.

The output layer: The nodes in this stratum are referred to as output units. It gives us access to the neural network's final prediction, which may be used to make final predictions.

Methodology:

A neural network with one hidden layer and 100 activation units has been put into practice (excluding bias units). The features (X) and labels (Y) were retrieved after the data was loaded from a mat file.

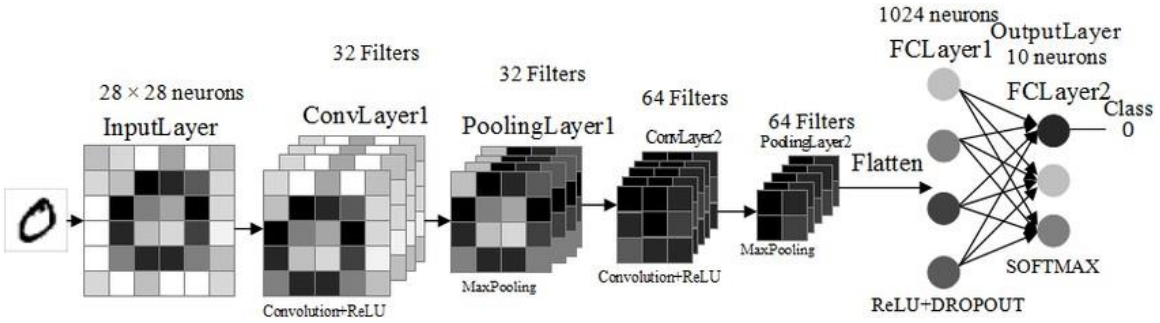
To prevent overflow during computation, features are then scaled into a range of [0,1] by dividing by 255. 10,000 testing cases and 60,000 training examples make up the data.

With the training data, feedforward is used to calculate the hypothesis, and backpropagation is then used to lower the error between the layers. To combat overfitting, the regularization parameter lambda is set to 0.1. To identify the model that fits the situation the optimizer runs for 70 times.

Process:

After receiving an input, neural networks change it using a number of hidden layers. Each group of neurons in a hidden layer is completely linked to every other neuron in the layer above it. One layer of neurons has perfect independence from one another. The "output layer" is the final layer to be fully connected.

Convolutional Neural Network Architecture:



Convolutional Layer:

The foundational component of a CNN is the convolutional layer. The parameters of the layer are a set of learnable filters (or kernels) that cover the entire depth of the input volume but have a narrow receptive field. As a result, the network picks up filters that turn on when it detects a certain kind of feature at a particular spatial location in the input.

Feature Extraction:

All neurons in a feature share the same weights. In this way all neurons detect the same feature at different positions in the input image. Reduce the number of free parameters.

Tensorflow:

An open-source machine learning library for both research and production is called TensorFlow. TensorFlow provides developers of all skill levels with APIs for desktop, mobile, web, and cloud applications.

Pytorch:

PyTorch is a machine learning framework based on the Torch library, used for applications such as computer vision and natural language processing, originally developed by Meta AI and now part of the Linux Foundation umbrella. Although the Python interface is more polished and the primary focus of development, PyTorch also has a C++ interface.