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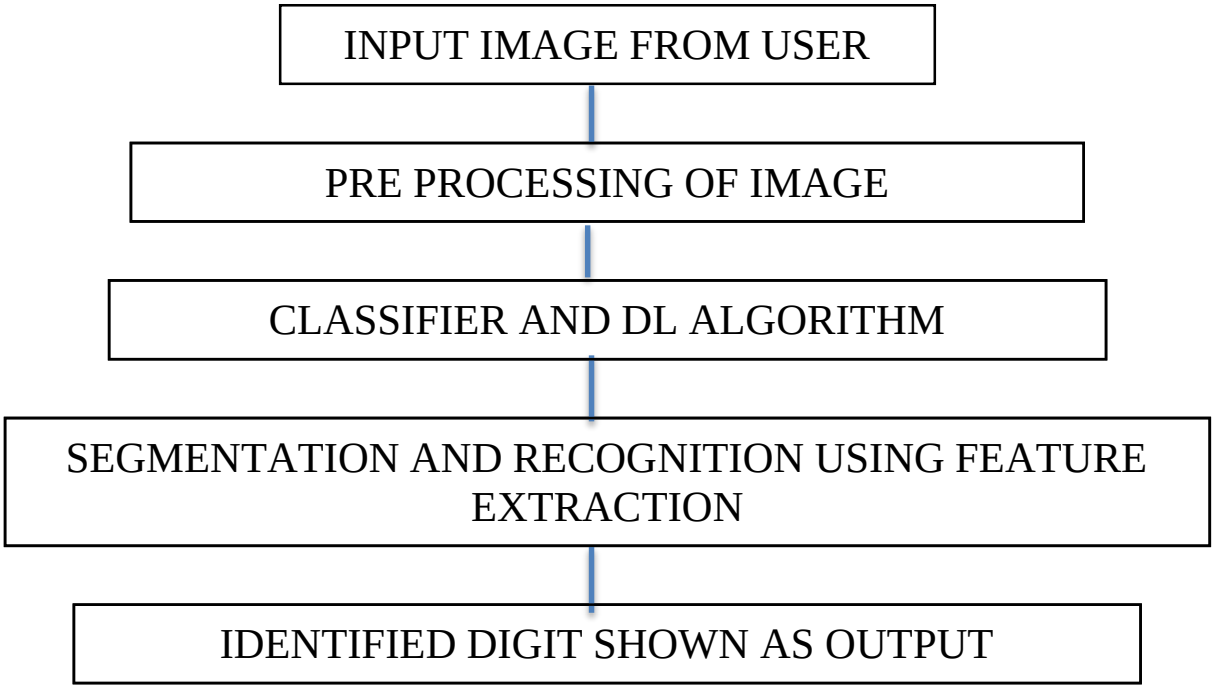
A Novel Method For Handwritten Digit Recognition System
Solution Architecture:



PROJECT DESCRIPTION:

Everyone in the world has a distinctive writing style, and one of the exciting scientific initiatives now being performed is handwriting identification. It refers to a computer's capacity to automatically discern and understand handwritten numbers or letters. As a result of advances in science and technology, every element of life is being digitised to reduce the need for human labour. Thus, handwritten digit recognition is required in many real-time applications. The MNIST data collection, which contains 70000 handwritten digits, is frequently utilised for this recognition method. In order to train these photos and create a deep learning model, we use artificial neural networks. A web application is developed that allows users to upload pictures of handwritten numbers. The model examines this image and the detected result is returned to the User Interface.

SOLUTION ARCHITECTURE:

DATASET:

The MNIST data collection, which contains 70000 handwritten digits, is frequently utilised for this recognition method. In order to train these photos and create a deep learning model, we use artificial neural networks. A web application is developed that allows users to upload pictures of handwritten numbers. The model examines this picture. The 60,000 training and 10,000 testing labelled handwritten digit images in the MNIST Handwritten Digit Recognition Dataset.

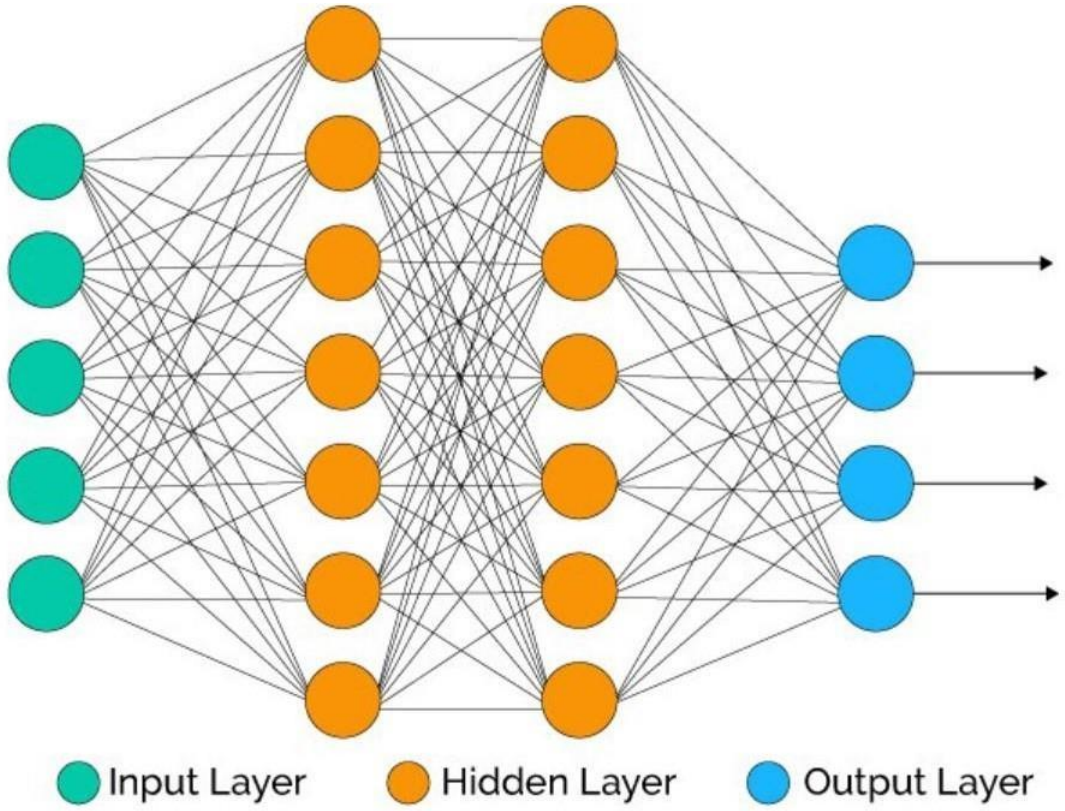
APPROACH:

This project will be approached utilising a three-layered neural network.

The input layer: The input layer transfers the information from our example systems to the following layer so that the latter can compute its activations.

The hidden layer: The network's nonlinear ties are provided by hidden units termed activations that make up the hidden layer. Depending on our needs, there can be a variety of concealed layers.

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.



A neural network is a simulation of how the brain works. It consists of many layers that have different activations; these activations resemble the neurons in our brain. A neural network makes an effort to discover parameters from a set of data that may help in comprehending the underlying linkages. Since neural networks are capable of adapting tochanging input, the network can produce the best outcome without having to change the output criterion

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 regularisation parameter lambda is set to 0.1. To identify the model that fits the situation the optimizer runs for 70 times.

WORKING:

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 have perfect independence from one another. The "output layer" is the final layer to be fully connected.

CONVOLUTION 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. Each filter is convolved across the width and height of the input volume during the forward pass, computing the dot product between each filter entry and the input to create a two-dimensional activation map of the filter. 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 :

The feature extraction network uses the input image as a starting point. The neural network uses the extracted feature signals for classification. The result is subsequently generated by the neural network categorization based on the image features. The convolution layer stacks and sets of pooling layers are part of the neural network for feature extraction. The convolution layer, as its name suggests, uses the convolution method to modify the image. It could be compared to a collection of digital filters. The layer of pooling transforms the neighbouring pixels into a single pixel. The pooling layer then decreases the image dimension. As CNN's primary concern is the image, the convolution and pooling layers' procedures are intuitively in a two-dimensional plane. This is one of CNN's distinctions with other neural networks

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. To get started, refer to the sections below. We can achieve text output and sound output by scanning the number digit and converting it to PNG format using the python3 command in the terminal.