HANDWRITTEN CHARACTER RECOGNITION

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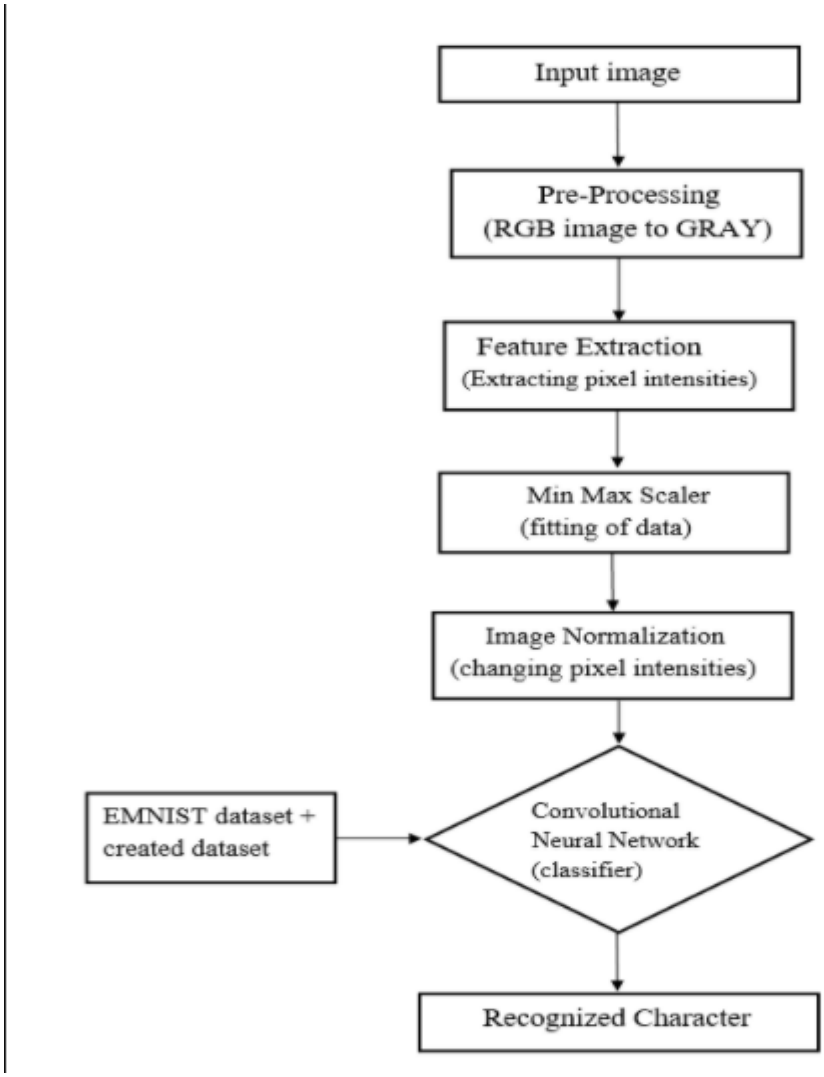
Abstract:

An attempt is made to recognize handwritten characters for English alphabets using multilayer Feed Forward neural network. EMNIST dataset which consists of English alphabets and numbers are made use of to train the neural network. EMNIST balanced dataset consist of 131,600 images of characters and 47 classes .The feature extraction technique is obtained by normalizing the pixel values. Pixel values will range from 0 to 255 which represents the intensity of each pixel in the image and they are normalized to represent value between 0 and 1. Convolutional neural network is used as a classifier which trains the EMNIST dataset. The prediction for the given input image is obtained from the trained classifier.

Architecture:



Dataset:

EMNIST dataset is downloaded and made use by using python mnist-parser. Following python code will load emnist-balanced dataset to a python variable:

```
from mnist import MNIST
emnist = MNIST('C:\\Users\\rama_sankar\\Anaconda3\\project\ emnist_data')
emnist.select_emnist('balanced')
images,labels = emnist.load_training()
testIM,testLAB = emnist.load_testing()
```

Preprocessing Data:

In preprocessing we convert all RGB image into greyscale image.

A grayscale (or graylevel) image is simply one in which the only colors are shades of gray. The reason for differentiating such images from any other sort of color image is that less information needs to be provided for each pixel. In fact a `gray' color is one in which the red, green and blue components all have equal intensity in RGB space, and so it is only necessary to specify a single intensity value for each pixel, as opposed to the three intensities needed to specify each pixel in a full color image.

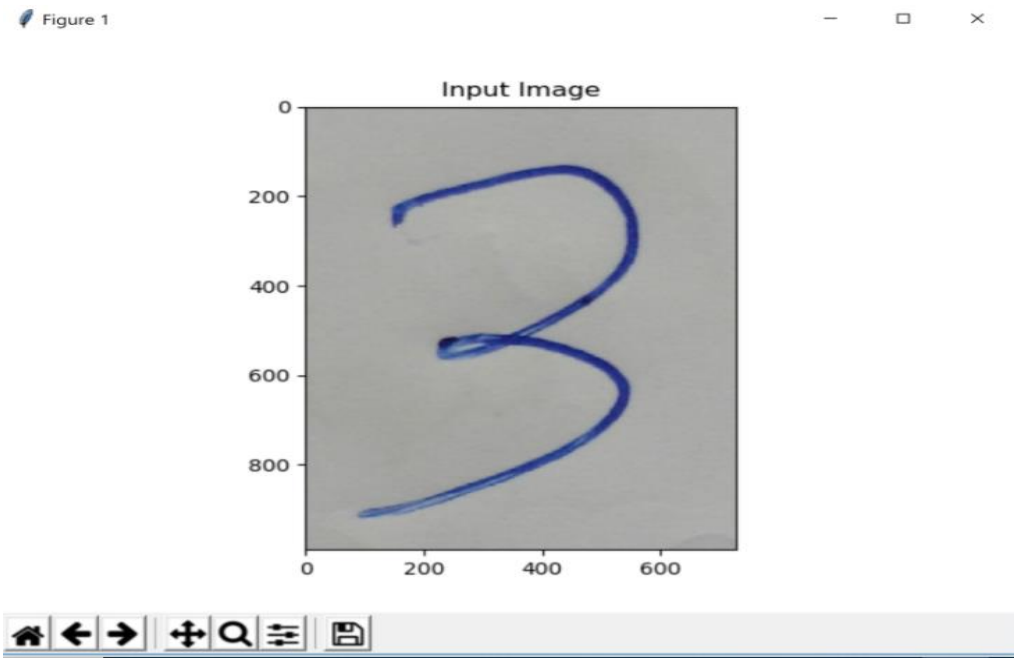
Often, the grayscale intensity is stored as an 8-bit integer giving 256 possible different shades of gray from black to white. If the levels are evenly spaced then the difference between successive graylevels is significantly better than the graylevel resolving power of the human eye.

Grayscale images are very common, in part because much of today's display and image capture hardware can only support 8-bit images. In addition, grayscale images are entirely sufficient for many tasks and so there is no need to use more complicated and harder-to-process color images.

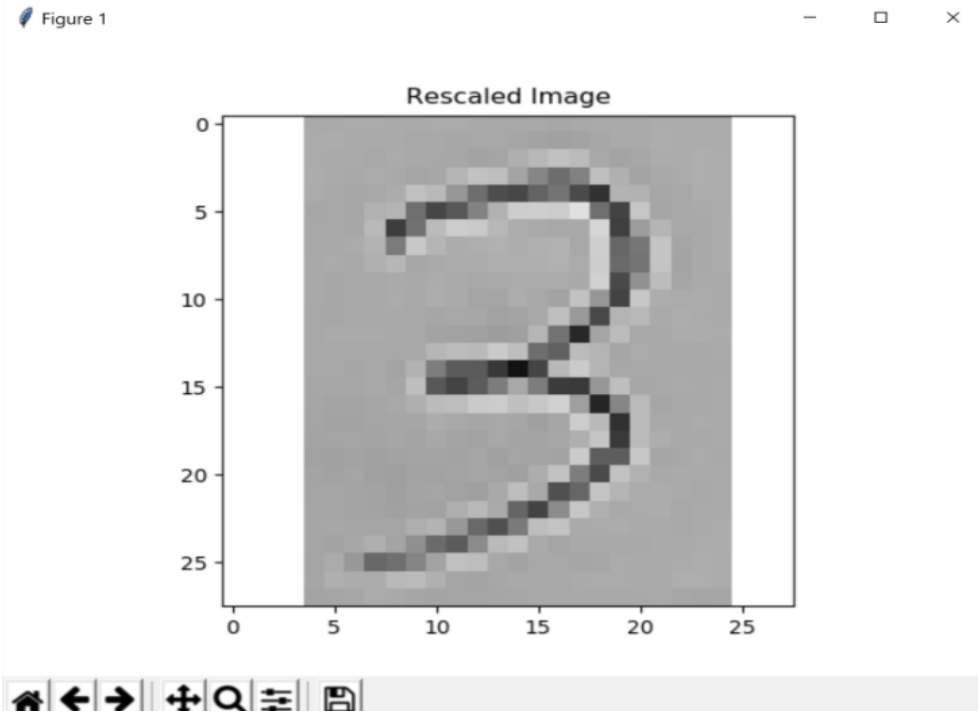
Min Max scaler is used to is used to normalise data. It change all the values of data in given range which makes computations very easy.

One hot encoder is used to convert ordinal values into nominal values.

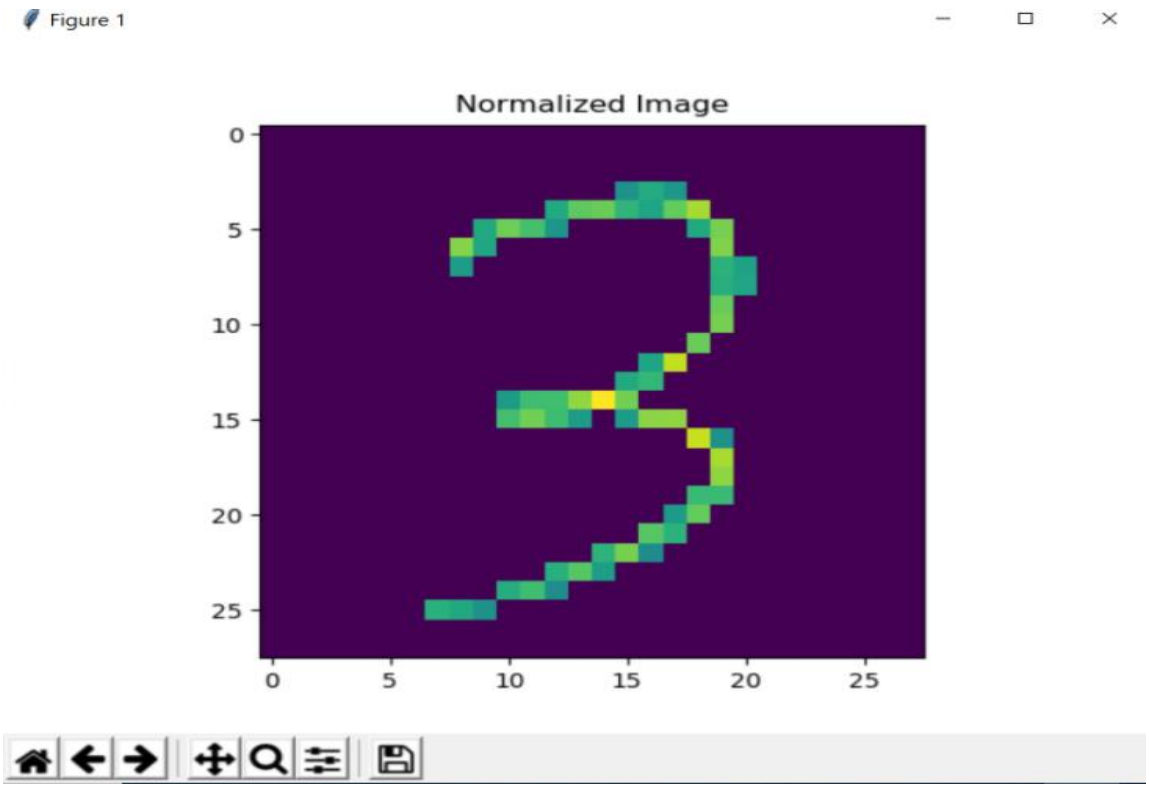
Input image:



Grey Scaled Image:



Normalised image:



Building CNN:

RELU (Rectified linear unit) activation function is used.

$R(z)=\{z:z>0, \alpha z:z<=0\}$

2 types of max pooling layers are created of different sizes.

Pooling layers provide an approach to down sampling feature maps by summarizing the presence of features in patches of the feature map.

Two common pooling methods are average pooling and max pooling that summarize the average presence of a feature and the most activated presence of a feature respectively.

Dropout layer is used to avoid over fitting of data.

Overfitting is a case where CNN model works good on training data but doesn't perform well on testing data.

The size of output layer is equal to size of one hot encoded labels.

Each and every output represesnts different character in our range.

Output :