

Ideation Phase Literature Survey

Date	19 September 2022
Team ID	PNT2022TMID15430
Project Name	A Novel Method for Handwritten Digit Recognition System
Maximum Marks	2 Marks

Literature Survey:

Some of the works in the field of handwritten digit recognition have been listed below: Pal and Singh [1] utilized multilayer perceptron (MLP) for recognizing handwritten English characters and achieved accuracy up to 94% and improved computation time for training the dataset.

Dutt and Dutt [2] demonstrated multilayer CNN using Keras and Theano libraries which attained 98.7% recognition accuracy on MNIST dataset. Ghosh and Maghari [3] did comparative study on three neural network approaches demonstrating that DNN was the best algorithm with 98.08% accuracy. However, every neural network has some error rate due to similarity in digit shape (e.g. 3 and 8 and 6 and 9).

Hamid [4] have performed handwritten digit recognition over MNIST dataset using CNN, SVM (Support Vector Machines) and KNN (K-Nearest Neighbour) classifiers. In their work, KNN and SVM predicted the outcomes correctly on datasets but Multilayer perceptron fails to recognize the digit 9 due to non-convex function as it gets stuck in the local minima. It was concluded that the accuracy would improve by using CNN with Keras.

LeNet-5 Architecture we used in this project was taken from ref. [5] which is going to form core part of our model.

Dataset used in this project was taken from yen Lecun MNIST dataset ref. [6]

After deep analysis of the related literature, it comes to know that CNN is supposed to be the best classifier than support vector machine (SVM), K-Nearest Neighbour (KNN) and random forest classifier (RFC) for HDR. Therefore, in this project, the task of HDR is accomplished by using the CNN, incorporating a 5 layer sequential CNN framework, with rectified linear units (ReLU) activations that have never been reported. The goal is achieved by establishing a model that can recognize and determine the handwritten digits from its image with high accuracy and low computation time. We aim to complete this by using the concepts of convolutional neural network. The proposed CNN framework is well equipped with suitable parameters for high accuracy of MNIST digit classification. The time factor is also considered for training the system. Furthermore, high accuracy is counter verified by changing the amount of CNN layers. Employment of additional pooling layers removes discretionary details in images and implants other higher-level characteristics. The MNIST dataset was used to train the network in experiments. MNIST is a handwritten digit dataset, which consists of 60,000 training images and 10,000 images in the test set. The digits are centered in a fixed size (28X28) image. These algorithms are employed to determine the accuracy with which these digits are classified. CNN classification proposed for HDR seems to be superior to other approaches used for handwritten characters/pattern identification in terms of high accuracy and low computational time. It was noticed that 7 layer LeNet-5 CNN training and prediction speed was efficient and quite good. So, the goal to create a model which can recognize the digits by implementing CNN-based framework for HDR will produce higher accurate and precise results