

# A NOVEL METHOD FOR HANDWRITTEN DIGIT RECOGNITION SYSTEM

## LITERATURE SURVEY

**Abstract:** Humans with the help of their brain can recognize the things that they see. Similarly, deep neural networks is developed for the computers to recognize what they see through the UI. Handwritten digit recognition is the ability of a computer to receive and interpret intelligible handwritten digit input from sources such as paper documents, photographs, touch-screens and other devices. The applications of digit recognition include in postal mail sorting, bank check processing, form data entry, etc. The heart of the problem lies within the ability to develop an efficient algorithm that can recognize hand written digits and which is submitted by users by the way of a scanner, tablet, and other digital devices.

This project proposes to create a deep learning model using Convolutional Neural Network. Convolutional Neural Networks (CNNs) is very well known deep learning algorithm which can be used to process image. It assigns weights and biases to various parts of the image and is competent of differentiating one image from another image. Some of the well-known CNN architectures are GoogLeNet (22 layers), AlexNet (8 layers), VGG (16–19 Ali), and ResNet (152 layers).

Here we intend to use AlexNet as it allows multi GPU training. By doing so, half of the data can be trained in one GPU and the rest is trained in another. The main objective is to obtain greater accuracy with the use of a GPU rather than using a CPU, which consumes time for large data sets.

**Keywords:** CNN, AlexNet, Handwritten Digit Recognition, MNIST.

## Literature Review:

1. Savita Ahlavat and et al (2020) proposed an approach based on Improved Handwritten Digit Recognition using CNN with an accuracy of 99.27%.

In this paper, with the aim of improving the performance of handwritten digit recognition, they valuated variants of a convolutional neural network to avoid complex pre-processing, costly feature extraction and a complex ensemble (classifier combination) approach of a traditional recognition system.

**Limitations:** The different architectures of CNN, hybrid CNN,CNN - RNN and CNN-HMM models, and domain - specific recognition system, are not thoroughly inquired and evolutionary algorithms are not clearly explored for optimizing CNN learning parameters ,the number of layers, learning rate and kernel sizes of convolutional filters.

2. Vijayalakshmi R Rudraswaminath and et al (2019) attempted Handwritten Digit Recognition using CNN with an accuracy of 98.72%.

In this paper, the most widely used Machine learning algorithms, KNN, SVM, RFC and CNN have been trained and tested on the same data in order acquire the comparison between the classifiers.

**Limitations:**The fluctuation of accuracies for handwritten digits was observed for 15 epochs by varying the hidden layers.

The accuracy curves were rendered for the six cases for the different parameter using CNN MNIST digit dataset.

However, there is no clear explanation given for observing variation in the overall classification accuracy by varying the number of hidden layers and batch size.

**3.** Fathma Siddhique and et al (2019) developed an approach based on Recognition of Handwritten Digit using Convolutional Neural Network in Python with TensorFlow and Comparison of Performance for Various Hidden Layers.

In this paper, they observed the variation of accuracies of CNN to classify handwritten digits for 15 epochs using various numbers of hidden layers and epochs and to make the comparison between the accuracies.

For this performance evaluation of CNN, they performed the experiment using Modified National Institute of Standards and Technology(MNIST) dataset.

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**4.** Akanksha Gupta and et al (2021) attempted Review on Deep Learning Handwritten Digit Recognition using Convolutional Neural Network.

In this paper, Object Character Recognition (OCR) is used on printed or documented letters to convert them into text.

The database has training image database of 60,000 images and testing image database of 10,000 images.

The KNN algorithm describes categorical value by making use of majority of votes of K - nearest neighbors, the K value used to differ here.

**Limitations:**Results of HDR is improved a lot by using CNN classifier but it can be improved further in terms of complexity , duration of execution and accuracy of result by making combination of classifiers or using some additional algorithm with it.

**5.** Md. Anwar Hussain and et al (2019) proposed an approach on Recognition of Handwritten Digit using Convolutional Neural Network (CNN).

The goal of this work will be to create a model that will be able to identify and determine the handwritten digit from its image with better accuracy using using the concepts of Convolutional Neural Network and MNIST dataset.

Later it can be extended for character recognition and real-time person's handwriting. The results can be made more accurate with more convolution layers and more number of hidden neurons.

**Limitations:** Training set size affects the accuracy and the accuracy increases as the number of data increases. Even if there is less data in the training set, there must be a smaller impact of training error and test error.