

# **LITERATURE SURVEY**

## **A NOVEL METHOD FOR HANDWRITTEN DIGIT RECOGNITION SYSTEM**

### **1. Handwritten digits recognition with artificial neural network**

**Authors: K.Islam , G. Mujtaba, H.F.Nweke, R.G.Raj**

In a computer vision system, handwritten digits recognition is a complex task that is central to a variety of emerging applications. It has been widely used by machine learning and computer vision researchers for implementing practical applications like computerized bank check numbers reading. In this study, we implement a multi-layer fully connected neural network with one hidden layer for handwritten digit recognition. The testing has been conducted from publicly available MNIST handwritten database. From the MNIST database, we extracted 28,000 digits images for training and 14,000 images for performing the test. Our multi-layer artificial neural network has an accuracy of 99.60% with the test performance.

### **2. Handwritten digit recognition using various neural network approaches**

**Authors: Sakshi ca, K. Gupta**

Handwritten digit recognition is one of the important problems in computer vision these days. There is a great interest in this field because of many potential applications, most importantly where large number of documents must be dealt such as post mail sorting, bank cheque analysis, handwritten form processing etc. so a system should be designed in such a way that it is capable of reading handwritten digits and provide appropriate results. This paper presents a survey on various neural approaches to recognize handwritten digits.

### **3. Handwritten Digit Recognition of MNIST dataset using Deep Learning state-of-the-art Artificial Neural Network (ANN) and Convolutional Neural Network (CNN)**

**Authors: Drishti Beohar, A. Rasool**

Handwritten digit recognition is an intricate assignment that is vital for developing applications, in computer vision digit recognition is one of the major applications. There has been a copious exploration done in the Handwritten Character Recognition utilizing different deep learning models. Deep learning is rapidly increasing in demand due to its resemblance to the human brain. The two major Deep learning algorithms Artificial Neural Network and Convolutional Neural Network which have been compared in this paper considering their feature extraction and classification stages of recognition. The models were trained using categorical cross-entropy loss and ADAM optimizer on the MNIST dataset. Backpropagation along with Gradient Descent is being used to train the networks along with reLU activations in the network which do automatic feature extraction. In neural networks, Convolution Neural Network (Conv Nets or Convolutional neural networks) is one of the primary classifiers to do image recognition, image classification tasks in Computer Vision.

### **4. A Novel Method For Hand Written Digit Recognition Using Deep Learning**

**Authors: Rohini.M , Dr.D.Surendran**

Handwritten digit recognition has recently been of very interest among the researchers because of the evolution of various Machine Learning, Deep Learning and Computer Vision algorithms. In this report, we compare the results of some of the most widely used Machine Learning Algorithms like CNN- convolution neural networks and with Deep Learning algorithm like multilayer CNN using Keras with Theano and TensorFlow. MNIST is a dataset which is widely used for handwritten digit recognition. The dataset consists of 60,000 training images and 10,000 test images. The artificial neural networks can all most mimic the human brain and are a key

ingredient in image processing field. For example, Convolution Neural networks with back propagation for image processing. The applications where these handwritten digit recognition can be used are Banking sector where it can be used to maintain the security pin numbers.

## **5. A Survey on using Neural Network based Algorithms for Hand Written Digit Recognition**

**Authors: Muhammad Ramzan, Shahid Mehmood Awan, Ahsan Mahmood**

The detection and recognition of handwritten content is the process of converting non-intelligent information such as images into machine editable text. This research domain has become an active research area due to vast applications in a number of fields such as handwritten filing of forms or documents in banks, exam form filled by students, users' authentication applications. Generally, the handwritten content recognition process consists of four steps: data pre-processing, segmentation, the feature extraction and selection, application of supervised learning algorithms. In this paper, a detailed survey of existing techniques used for Hand Written Digit Recognition (HWDR) is carried out. This review is novel as it is focused on HWDR and also it only discusses the application of Neural Network (NN) and its modified algorithms. We discuss an overview of NN and different algorithms which have been adopted from NN.

## **6. Handwritten Digit Recognition Using Machine Learning Algorithms**

**Authors: S M Shamim**

Handwritten character recognition is one of the practically important issues in pattern recognition applications. 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 paper

presents an approach to off-line handwritten digit recognition based on different machine learning technique. The main objective of this paper is to ensure effective and reliable approaches for recognition of handwritten digits.

## **7. Hand Written Digit Recognition using Machine Learning**

**Authors:** Rohan Sethi, Ila Kaushik

Hand-written character and digit recognition have been one of the most exigent and engrossing field of pattern recognition and image processing. The main aim of this paper is to demonstrate and represent the work which is related to hand-written digit recognition. The hand-written digit recognition is a very exigent task. In this recognition task, the numbers are not accurately written or scripted as they differ in shape or size; due to which the feature extraction and segmentation of hand-written numerical script is arduous. The vertical and horizontal projections methods are used for the purpose of segmentation in the proposed work. SVM is applied for recognition and classification, while Convex hull algorithm is applied for feature extraction.

## **8. Neural Network methods for handwritten digit Recognition provided with MNIST data set**

**Authors:** Lars Kai, Christian

In Handwritten Digit Recognition, there are different challenges faced while attempting to solve this problem. The handwritten digits are not always of the same size, thickness, or orientation and position relative to the margins. Our goal was to implement a pattern classification method to recognize the handwritten digits provided in the MNIST data set of images of hand written digits (0 to 9). The data set used for our application is composed of 300 training images and 300 testing images, and is a subset of the MNIST data set (originally composed of 60,000 training images and 10,000 testing images). Each image is a 28x28 grayscale (0 to 255) labelled representation of an individual digit.

## **9. Handwritten Digit Recognition using Deep Learning Algorithm(CNN)**

**Authors:** Anuj Dutt, Aashi Dutt

some of the most widely used Machine Learning Algorithms like KNN & RFC and with Deep Learning algorithm like multilayer CNN using Keras with Theano and Tensorflow. It had applied neural network methods to a large, real-world task. Our results appear to be the state of the art in digit recognition. We demonstrated that a general-purpose neural network chip can be incorporated as an accelerator in a large network. They found that real problems with regularity scale well. They also showed that a network can be trained on a low-level representation of data that has minimal preprocessing.

## **10. Extract data from image using Convolutional Neural Networks**

**Author:** Gaganashree J

The main purpose of digital identifier extraction is to eliminate data redundancy and use set of digital attributes to get a more effective realization of word images. The point is to extract most of the important information from the original image data. In addition, the curve should not be as smooth as printed characters. In addition, characters dataset can be drawn in different sizes. This should always be written on the guide in a straight or vertical position. The task of recognizing handwritten digits with the help of a classifier is particularly important for the following applications such as online digit recognition on a tablet computer, recognize zip codes on mail, processing bank check applications. Various problems arise when trying to solve this problem. The size, thickness, direction, and position relative to the edge of handwritten numbers are not always the same. The main goal is to update the method of describing perception patterns characterization method to Note the handwritten digits represented in the MNIST Handwritten Digit Image Record