# A Novel Method for Handwritten Digit Recognition System

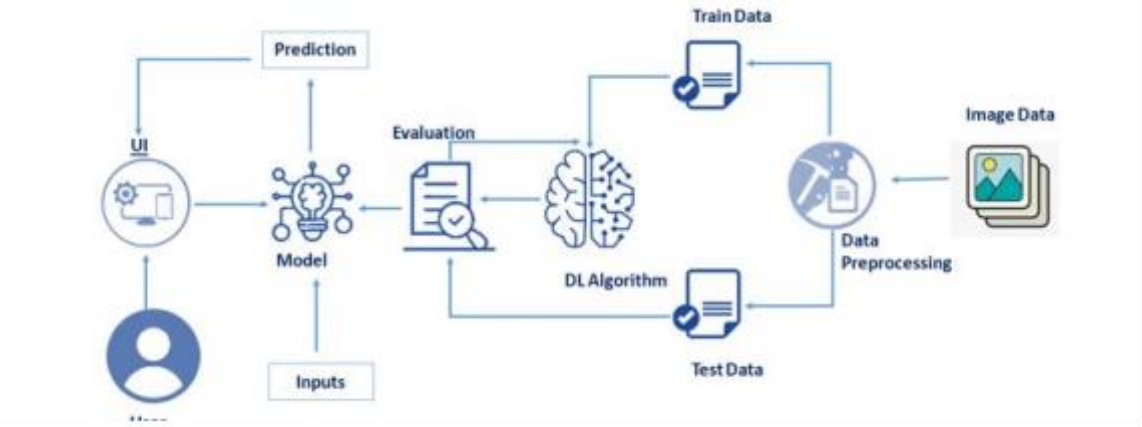

## ABSTRACT:

Recently handwritten digit recognition has become impressively significant with the escalation of the Artificial Neural Networks (ANN). Apart from this, deep learning has brought a major turnaround in machine learning, which was the main reason it attracted many researchers. We can use it in many applications. The main aim of this article is to use the neural network approach for recognizing handwritten digits. The Convolution Neural Network has become the center of all deep learning strategies. Optical character recognition (OCR) is a part of image processing that leads to excerpting text from images. Recognizing handwritten digits is part of OCR. Recognizing the numbers is an important and remarkable subject. In this way, since the handwritten digits are not of same size, thickness, position, various difficulties are faced in determining the problem of recognizing handwritten digits. The unlikeness and structure of the compositional styles of many entities further influences the example and presence of the numbers. This is the strategy for perceiving and organizing the written characters. Its applications are such as programmed bank checks, health, post offices, for education, etc.


## INTRODUCTION:

Image are easily the human brain easily processes and analyzes images. When we see a particular image, the brain can easily divide it in chunks and recognizes its different parts. The brain goes through this step naturally, which includes analyzing these images as well as comparing and differentiating their multiple Image are easily the human brain easily processes and analyzes images. features and characteristics from what the brain already recognized in order to recognize these characteristics. Image Processing is a branch of computer science that attempts to do the identical thing with computers. The field of image processing entails analyzing images to take out some useful and crucial information from images.

## TECHNICAL ARCHITECTURE:




## PROBLEM STATEMENT:

Handwritten digit recognition is very important as it will be very helpful to reduce human effort. As each individual has different handwritings for representing digits, the system should have a capability to identify every handwriting with maximum accuracy. Such a system will be useful to reduce human interventions in identification, as everything is being digitized. The main objective of this work is to ensure effective and reliable approaches for recognition of handwritten digits and make banking operations easier and error free. Handwriting recognition has gained a lot of attention in the field of pattern recognition and machine learning due to its application in various fields. Various techniques have been proposed to for digit recognition in handwriting recognition system

## METHODOLOGY AND CLASSIFICATION

For developing the deep learning model, we will be using Convolutional Neural Network. Convolutional networks are ingeniously useful in biological psychology since the sequence of connections between neurons mimicked the animal visual cortex's association. In a limited area of the chromatic field known as the receptive field, independent cortical neurons respond to solitary stimuli. Contrary neurons' receptive fields partly overlap, allowing them to occupy the whole visual field. One of the main propositions of OCR is recognizing handwritten digit characters. In this instance, we will emphasize the structure of a mechanism by considering recognizing handwritten digits. We'll read a variety of images containing handwritten digits extracted from the MNIST database and try to figure out which digit is represented by each image.

## CONCLUSION:

In this project, the Handwritten Digit Recognition using Deep learning methods has been implemented. The most widely used Machine learning algorithms CNN has been trained and tested on the MNIST dataset. With extensive testing using the MNIST data, the current function suggests the role of various hyper parameters. We also confirmed that a good adjustment of hyper parameters is important in improving the performance of Convolutional Neural Network. Utilizing this deep learning technique, a high amount of accuracy can be obtained. This model is able to achieve a recognition rate of 98.85% accuracy and is significantly identifying real world images as well. The effect of increasing the number of convolutional layers on CNN structure in the performance of handwritten digital recognition is clearly demonstrated by experiments. Later it can be expanded to identify the character and a real-time person's handwriting. Digital recognition is the first step in the larger field of Artificial Intelligence and Computer Vision.

## REFERENCES:


1. FaisalTehseen Shah, Kamran Yousaf,"Handwritten Digit Recognition Using Image Processing and Neural Networks", Proceedings of the World Congress on Engineering, vol., 2007.

2. Dr.Kusumgupta ,"a comprehensive review on handwritten digit recognition using various neural network approaches", international journal of enhanced research in management & computer applications, vol. 5, no. 5, pp. 22-25, 2016.

3. Saeed AL-Mansoori,"Intelligent Handwritten Digit Recognition using Artificial Neural Network", Int. Journal of Engineering Research and Applications, vol. 5, no. 5, pp. 46-51, 2015.

4. Viragkumar N. Jagtap , Shailendra K. Mishra,"Fast Efficient Artificial Neural Network for Handwritten Digit Recognition", International Journal of Computer Science and Information Technologies, vol. 52, no. 0975- 9646, pp. 2302-2306, 2014.

5. Ishani Patel, ViragJagtap and OmpriyaKale."A Survey on Feature Extraction Methods for Handwritten Digits Recognition", International Journal of Computer Applications, vol. 107, no. 12, pp. 11-17, 2014.