Literature Survey:

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Sr. No	Title of Paper	Name of Authors	Published Year	Remarks
1.	Handwritten Digit Recognition using CNN	Mayank Jain, Gagandeep Kaur, Muhammad Parvez Quamar, Harshit Gupta	2021	CNN consists of 4 hidden layers which help in extraction of the features from the images and is able to predict the result.The layers of CNN are (a) Convolutional Layer (b) ReLu Layer (c) Pooling Layer (d) Fully Connected Layer. CNN is because the fundamental favourable position of CNN contrasted with its archetypes is that it consequently recognizes the significant highlights with no human management. The fundamental target of this paper is to give effective and solid procedures to acknowledgment of transcribed numerical by looking at different existing arrangement models.
2.	Handwritten Digit Recognition using Convolutional Neural Network	Chao Zhang, Zhiyao Zhou, Lan Lin	2020	Deep learning-based handwritten digit recognition systems are more accurate than conventional ones due to advancements in artificial intelligence technology. Traditional feature extraction techniques including Scale

				Invariant Feature Transform (SIFT), Histogram of Oriented Gradient (HOG), and Speeded-Up Solid Qualities Handwritten digit recognition is essential in large-scale data statistics and the banking sector. This paper presents a brand-new handwritten digit recognition technique based on convolutional neural networks. TensorFlow will automatically distinguish between each variable's loss function before determining the best gradient descent path to update the weight. There are numerous built-in optimization algorithms in TensorFlow.This approach has a very high recognition accuracy for different people's handwritten digits. such as bright and dim lighting, as well as cloudy and sunny days. Comparing this approach to established traditional methods like the histogram of oriented gradient reveals the advantages clearly (HOG).
3	Hand Written Digit Recognition	Rohan Sethi , Ila Kaushik	2020	This paper's primary goal is to illustrate and is made to represent research on

| | using Machine Learning | | | hand-written digit recognition. Convex hull technique is used for feature extraction, whereas SVM is used for recognition and classification. Optimal Character Recognition (OCR), Barcode Recognition, Number Plate Recognition.

The most important justification for using this method is when there is sufficient data for its flawless use to carry out the necessary classification. Furthermore, only in the presence of non-linear decision boundaries is the direct solution realised. When the value of K varies, this algorithm categorically explains the majority votes of the K closest neighbours. Euclidean distance, Manhattan distance, Minkowski function, Hamming function, and Mahalanobis function are among the distance functions that can be used with the KNN method. The paper uses the effective KNN supervised machine learning technique to classify handwritten digits. For the purpose of training a supervised classification machine learning |
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				model, a training dataset containing labelled data is fed to the classifier as input. After successful training, the model is then able to classify handwritten digits based on any testing point fed to the classifier, thanks to the use of Euclidean distance, which identifies the closest labelled datapoint in relation to the testing data point. KNN supervised machine learning technique was employed for classification. Python Notebook, a web application that utilises a local server and is a part of the Anaconda software programme suite.Both training and testing MNIST datasets were used. Future development of this work could lead to quick calculation, which would cut down on time, boost productivity, and aim for better outcomes.
4.	Handwritten Digit Recognition using Machine learning	Apaar Chadha, Gaurav Yadav, Keshav Ahlawat	2022	The task is to identify the full number entered by the user and to recognise user-defined handwritten digits. The user-inputted number is then transformed to a binary, octal, or hexadecimal format. For the same, a canvas widget will be

				used to present the user in a graphical user interface (GUI). Machine learning algorithms put forth a lot of effort to identify patterns in various writing styles. Handwritten digits can be recognised using a variety of techniques. Reduced training time is achieved with Compute Unified Device Architecture (CUDA) on a GPU.
5.	A Machine Learning and Deep Learning Approach for Recognizing Handwritten Digits	Ayushi Sharma , Harshit Bhardwaj , Arpit Bhardwaj , Aditi Sakalle, Divya Acharya ,and Wubshet Ibrahim	2022	The MNIST database is the central database used to train separators. A training set with 60,000 labels and a test set of 10,000 are included in the database. Each image was subject to a primary orientation method where the value of each pixel was divided by the maximum pixel value of the sample In this paper, they applied machine learning and deep-learning techniques to predict the handwritten digits. they are using keras as the backend and tensorflow as the software library. The CNN classifier outperforms the

				other classifier with a classification accuracy of 98.83%