

Project Design Phase-I

Proposed Solution

Date	19 September 2022
Team ID	PNT2022TMID01546
Project Name	Project - A Novel Method for Handwritten Digit Recognition System
Maximum Marks	2 Marks

Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<p>As everyone in the world has a unique writing style, handwriting identification is one of the fascinating scientific projects now being conducted. It is the capacity of a computer to automatically recognise and comprehend handwritten numbers or letters. Every aspect of life is being digitalized to lessen the need for human work as a result of advancements in science and technology. Consequently, numerous situations call for handwritten digit recognition. The MNIST data collection, which contains 70000 handwritten digits, is frequently utilized for this identification method. In order to train these photos and create a deep learning model, we employ artificial neural networks. A web application is developed that allows users to upload pictures of handwritten numbers.</p>

2.	Idea / Solution description	A computer system's capacity to detect handwritten inputs, such as numbers and characters, from a range of sources, including emails, documents, photographs, and letters, is known as Handwritten digit recognition.
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		<p>Here is where deep learning is used. Deep learning has recently gained popularity as a method for image processing, object detection, handwritten character and digit recognition. These tools strengthen the applications, which increases their accuracy. Artificial neural networks, a crucial component of the image processing industry, are capable of closely resembling the human brain. Examples include Google's Deep Mind for making art by learning from the styles of current artists, Convolutional Neural Networks with Back Propagation for image processing etc.</p>
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3.	Novelty / Uniqueness	<p>The User layer is the top layer of the architecture. The users who engage with the programme and get the desired outcomes make up the user layer.</p> <p>The frontend architecture of the application is made up of the following three levels. The HTML, CSS, and JavaScript development framework Bootstrap will be used to create the application. The localhost, which is displayed in the browser, is where the programme is deployed. The user will be able to upload images of the handwritten numbers to the app to have them digitalized. The business layer, which consists of logical computations based on the request from the client side, is the layer sandwiched between the database and view layers. The service interface is also included.</p> <p>There are two sets of backend layers which consists of Training and Testing data. The complete MNIST dataset is being divided into training set of sixty thousand examples and test of 10,000 examples.</p>
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4.	Social Impact/ Customer Satisfaction	<p>Instead of depending and studying on their handwriting, more and more individuals are concentrating on utilizing personal computers. The internet and apps are getting smarter than they used to be as the only explanation. Additionally, the primary culprit for the unreadable or low quality handwriting explanation for handwritten character recognition software's errors.</p>
5.	Business Model (Revenue Model)	<p>The network's training results are saved in npz format so that the programme won't have to repeat the training process each time a user tries to recognise a number. The logistic classifier, the softmax function, one hot encoding, cross entropy, and loss reduction using small batch gradient descent have all been utilized for classification. These are some of the fundamentals of neural networks that must be understood in order to process output from the network and present it to the user in an understandable manner.</p>

6.	Scalability of the Solution	<p>This work describes the application of deep learning to handwritten digit recognition. In order to make a comparison as to why we need deep learning techniques in important applications like Handwritten Digit Recognition, some of the most popular machine learning algorithms, such as CNN utilizing Tensorflow, have also been trained and evaluated on the same data. In this study, we've demonstrated how deep learning approaches can provide results with a very high level of accuracy will</p>
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		<p>be achieved. I am able to get an accuracy of 97.42% using the convolutional neural network with Keras and Theano as the backend. Each tool has a unique level of precision and complexity. Although the code and procedure are a little more sophisticated than typical Machine Learning algorithms, the accuracy gained suggests that the extra effort was worthwhile. Additionally, the CPU is the sole device used in the current implementation. As a result, we decided to evaluate the accuracy of three distinct algorithms by categorizing a handwritten digit picture as the needed digit. Future research on the subject of handwriting recognition is something we intend to do.</p>
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