A novel method for Handwritten Digit Recognition with Neural Networks

ABSTRACT

Character recognition is becoming increasingly important in today's society. It makes human work easier and aids in the resolution of more difficult issues. One example is handwritten character recognition, which is widely used around the world. This strategy was developed in order to recognize zip codes or postal codes for use in mail sorting. This can help.Individuals involved in the difficult-to-read postal code mail sorting process Researchers have been working on. For over thirty years, I've been working on handwriting recognition. The number of businesses participation in handwriting recognition research has steadily increased over the last few years.A number of years Handwriting processing has advanced as a result of a combination of factors such as increased recognition rates and use of complex systems

Literature Survey

Paper 1: Novel Deep Neural Network Model for Handwritten Digit Classification and Recognition

Year: 2021 Authors: Ayush Kumar Agrawal and Vineet Kumar Awasthi

An artificial neural network has a single hidden layer between the input and output layers, whereas a deep neural network has many hidden layers between the input and output layers. Deep neural networks employ multiple hidden layers to improve model performance and achieve greater accuracy than machine learning models. The majority of researchers work in the field of pattern recognition. Many patterns can be used in pattern recognition, such as handwritten numbers, characters, pictures, faces, sounds, and speech. This research focuses on the classification and recognition of handwritten digits. 1000 were used as test samples and 1000 as training samples. The USPS dataset contains 10000 image samples, 7291 of which are training samples and 2007 of which are testing samples. We've used the proposed deep neural network technique in this paper to classify and identify data from the ARDIS and USPS datasets. The suggested model consists of six layers with softmax and relu activation functions. After model implementation, accuracy for ARDIS samples reached 98.70% testing and 99.76% training, which is greater than accuracy from prior research. Additionally, using the USPS samples dataset, 98.22% training accuracy and 93.01% testing accuracy were attained. When compared to earlier methodologies, the data show that deep neural networks perform incredibly well.

Paper 2: A Novel Handwritten Digit Classification System Based on Convolutional Neural Network Approach

Year: 2021 Authors: Ali Abdullah Yahya, Jieqing Tan, Min Hu

A plethora of CNN classification algorithms have been proposed in the literature. These algorithms, however, do not account for proper filter size selection, data preparation, dataset constraints, or noise. As a result, few algorithms have significantly improved classification accuracy. The paper makes the following contributions to overcoming the drawbacks of these methods: First, the size of the effective receptive field (ERF) is calculated using domain knowledge. They use the ERF calculation to select a typical filter size, which improves the classification accuracy of our CNN. Second, excessive data produces inaccurate results, which reduces classification accuracy.Data preparation is performed prior to performing the data classification task to ensure that the dataset is free of any redundant or irrelevant variables to the goal variable. Third, data augmentation has been proposed as a method of reducing training and validation errors while avoiding dataset limitations.

Fourth, the paper proposes that an additive white Gaussian noise with a threshold of 0.5 be added to the MNIST dataset to mimic natural factors that can affect image quality in the real world. Our CNN algorithm achieves state-of-the-art performance in handwritten digit recognition, with a recognition accuracy of 99.98% and 99.40% with 50% noise.

Paper 3: Handwritten Character Recognition using Neural Network and TensorFlow

Year : 2019 Authors : Megha Agarwal, Shalika, Vinam Tomar, Priyanka Gupta

In this study, offline handwritten character recognition will be performed using Tensorflow and a convolutional neural network. Using SoftMax Regression, one can assign probabilities to one of the many characters in the handwritten text that have values ranging from 0 to 1, summed to 1. The goal is to develop software that is extremely accurate and has a low level of spatial and temporal complexity.

It was discovered that feature extraction strategies such as diagonal and direction produce significantly higher accuracy.

Outcomes in comparison to other traditional vertical and horizontal techniques are also used. Because of their high noise tolerance, neural network tried layers provide a more accurate outcome.

In neural networks, the feed forward model is a back-propagation algorithm that was primarily used to classify characters, recognize them, and receive ongoing training.

In addition to these, normalizing and feature extraction produced better and more effective results. Character recognition is the result of precision.

The paper will describe the best method for achieving more than 90% accuracy in Handwritten Character Recognition (HCR).

Paper 4: Improved Handwritten Digit Recognition Using Convolutional Neural Networks (CNN)

Year : 2020 Authors: Savita Ahlawat , Amit Choudhary , Anand Nayyar , Saurabh Singh and Byungun Yoon

Traditional handwriting recognition systems have relied on customized features and a large amount of prior knowledge. Based on these conditions, training an optical character recognition (OCR) system is difficult. In recent years, deep learning approaches have enabled significant performance in the field of handwriting recognition research. Nonetheless, the growing amount of handwritten data, combined with the availability of vast computing capacity, necessitates improvements in recognition accuracy and warrants further investigation. CNNs are the best solution for solving handwriting recognition challenges because they are extremely good at perceiving the structure of handwritten characters/words in ways that aid in the automatic extraction of distinguishing features.The proposed work will look into various design options for CNN-based handwritten digit recognition, such as the number of layers, stride size, receptive field, kernel size, padding, and dilution. Furthermore, we plan to evaluate the efficacy of various SGD optimization techniques in improving the performance of handwritten digit recognition. Using ensemble architecture improves a network's recognition accuracy. Because ensemble structures increase computational overhead and testing complexity, we want to achieve equal accuracy by using a pure CNN design without ensemble architecture in this case. As a result, a CNN design is created to achieve higher accuracy than ensemble systems while reducing operational complexity and expense.As a result, a CNN design is created to achieve higher accuracy than ensemble systems while reducing operational complexity and cost. In addition, we show how an appropriate combination of learning parameters in the design of a CNN leads to a new absolute record in categorizing MNIST handwritten digits. We ran numerous tests and achieved 99.87% recognition accuracy for an MNIST dataset.