A Novel Method for Handwritten Digit Recognition System

Domain: Artificial Intelligence

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Paper 1:

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

Drishti Beohar, Akhtar Rasool

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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 (ConvNets or Convolutional neural networks) is one of the primary classifiers to do image recognition, image classification tasks in Computer Vision.

Paper 2:

Handwritten Digit Recognition Using Machine Learning Algorithms

S M Shamim

Global Journal of Computer Science and Technology, 18(1), 17–23, *2018-04-13*

Handwritten character recognition is one of the practically important issues in pattern recognition applications. The applications of digit recognition includes 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. Several machines learning algorithm namely, Multilayer Perceptron, Support Vector Machine, NaFDA5; Bayes, Bayes Net, Random Forest, J48 and Random Tree has been used for the recognition of digits using WEKA. The result of this paper shows that highest 90.37% accuracy has been obtained for Multilayer Perceptron

Paper 3:

Character Recognition using Artificial Neural Network

Pranjali Pohankar, Namrata Taralkar, Snehalata Karmare, Smita Kulkarni

International Journal of Electronics Communication and Computer Engineering 5 (4), 2014

A neural network is a machine designed to model the way in which the brain performs a particular task. Character recognition techniques help in recognizing the characters written on paper documents and converting it in digital form. Handwritten character recognition is a very difficult problem due to great variation of writing style, different size and shape of the character. Neural network is a technique used to improve the accuracy and efficiency of the handwritten character recognition system. The error back propagation algorithm is used to train the MLP networks. The main advantage of the back propagation neural network (BPN) method is that it can fairly approximate a large class of functions. The aim of the paper is to use the improved neural network technique to recognize the offline handwritten characters.

Paper 4:

Handwritten Digit Recognition Based on Convolutional Neural Network

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In order to meet the needs of paperless offices and greatly improve work efficiency, it is necessary to research and implement a handwritten digit recognition system. Handwritten digit recognition plays an important role in large-scale data statistics and the financial business, such as industry annual inspection, population census, tax statements and checks, etc. This paper proposes a new type of handwritten digit recognition system based on convolutional neural networks (CNN). In order to improve the recognition performance, the network was trained with a large number of standardized pictures to automatically learn the spatial characteristics of handwritten digits. For model training, according to the loss function, the convolutional neural network continuously updates the network parameters with the data set in MNIST, which contains 60,000 examples. For model tests, the system uses the camera to capture the pictures composed of the images generated by the test data set of MNIST and the samples written by different people, then continuously processes the captured graphics and refreshes the output every 0.5 seconds. With the trained deep learning model, we got a recognition accuracy of 97.3% in the test process. Good performance in this experiment shows that our system can automatically recognize the handwritten digital content appearing in the target area and output the content label in real time.

Paper 5:

Offline handwritten digit recognition using neural network

Sumedha B Hallale, Geeta D Salunke

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering 2 (9), 4373-4377, 2013

Optical character recognition is a typical field of application of automatic classification methods. In this paper, we have introduced a whole new idea of recognition of isolated handwritten digits which is known to be a difficult task and still lacks a satisfactory technical solution. The present paper proposes a novel approach for recognition of handwritten digits ie neural network classification. Back propagation neural network is one of the simplest methods for training multilayer neural networks. In this paper, we designed a back propagation neural network and trained it with a set of handwritten digits. The average success rates of recognition of all digits are 91.2%.

Paper 6:

Simplified Neural Network Design for Hand Written Digit Recognition

Muhammad Zubair Asghar, Hussain Ahmad, Shakeel Ahmad, Sheikh Muhammad Saqib, Bashir Ahmad, Muhammad Junaid Asghar

International Journal of Computer Science and Information Security 9 (6), 319, 2011

Neural Network is an abstraction of the central nervous system and works as a parallel processing system. Optimization, image processing, Diagnosis and many other applications are made very simple through neural networks, which are difficult and time consuming when conventional methods are used for their implementation. Neural Network is the simplified version of the
human brain. Like the human brain, neural networks also exhibit efficient performance on perceptive tasks like recognition of visual images of objects and handwritten characters etc: Recognition of handwritten digits is one of the oldest applications of ANN. The recognition of

digits written in different handwritings and also from scanned text has remained a trouble thus it has received much attention from researchers in the field of artificial neural networks. In this research work a very simple and flexible neural network scheme is proposed and implemented for handwritten digit recognition, which will assist beginners and AI students who want to understand the perceptive capability of neural networks. In the proposed system, a very simple design of artificial neural networks is implemented.

Paper 7:

Persian Handwritten Digit Recognition using Support Vector Machines

Omid Rashnodi,Hedieh Sajedi,Mohammad Saniee Abadeh

International Journal of Computer Applications (0975 –8887), Volume 29–No.12, September 2011

In this paper, appropriate features set based on Discrete Fourier Transform coefficients and the box approachhave been proposed to achieve higher recognition accuracy, decreasing the features set dimensions and recognition time of Persian numerals. In classification phase, support vector machine (SVM) has been employed as the classifier. Feature sets consists of 154 dimensions, which are the Fourier coefficients in the contour pixels of input image, average angle and distance pixels which are equal to one in each boxthe box approach.The scheme has been evaluated on 80,000 handwritten samples of Persian numerals. Using 60,000 samples for training, scheme was testedon other 20,000 samples and 98.84% correct recognition rate was obtained.

Paper 8:

A Survey on using Neural Networkbased Algorithms forHandWritten Digit Recognition

Muhammad Ramzan,Shahid Mehmood Awan,Hikmat Ullah Khan,,Waseem Akhtar,Ammara Zamir,Mahwish Ilyas,Ahsan Mahmood

International Journal of Advanced Computer Science and Applications,Vol. 9, No. 9, 2018

The detection and recognition of handwrittencontent is the process of converting non-intelligent information such as images into machine edit-able text. This research domain has become an active research area due to vast applications in a number of fieldssuch as handwrittenfiling of forms or documents in banks, exam form filled by students, users' authentication applications. Generally, the handwritten contentrecognition process consistsof four steps: data preprocessing, segmentation, the featureextraction 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 discussesthe applicationof Neural Network (NN) and its modified algorithms. We discuss an overview of NN and different algorithms which have been adopted from NN. In addition, thisresearch study presents a detailed survey of the use of NN and its variants for digit recognition. Each existing work, we elaborate its steps, novelty, use of dataset and advantages and limitationsas well. Moreover, we present a Scientometricanalysis of HWDR which presents top journals and sources of research contentin this research domain. We also present research challenges and potential future work.

Paper 9:

Handwritten Digits Recognition with Decision tree Classification : a Machine learning approach

Tsehay Admassu Assegie, Pramod Sekharan Nair

International Journal of Electrical and Computer Engineering (IJECE) ,Vol. 9, No. 5, October 2019.

Handwritten digits recognition is an area of machine learning, in which a machine is trained to identify handwritten digits. One method of achieving this is with decision tree classification model. A decision tree classification is a machine learning approach that uses the predefined labels from the past known sets to determine or predict the classes of the future data sets where the class labels are unknown. In this paper we have used the standard kaggle digits dataset for recognition of handwritten digits using a decision tree classification approach. And we have evaluated the accuracy of the model against each digit from 0 to 9.

Paper 10:

Handwritten Digit Recognition Using Various Machine Learning Algorithms and Models

Pranit Patil

International Journal of Innovative Research in Computer Science & Technology (IJIRCST) ISSN: 2347-5552, Volume- 8, Issue- 4, July- 2020

Handwritten digit recognition is a technique or technology for automatically recognizing and detecting handwritten digital data through different Machine Learning models. In this paper we use various Machine Learning algorithms to enhance the productiveness of technique and reduce the complexity using various models. Machine Learning is an application of Artificial Intelligence that learns from previous experience and improves automatically through experience. We illustrate various Machine learning algorithms such as Support Vector Machine, Convolutional Neural Network, Quantum Computing, K-Nearest Neighbor Algorithm, Deep Learning used in Recognition technique.