

A Novel Method for Handwritten Digit Recognition System

Domain: Artificial Intelligence

Batch: B9-3A5E

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Paper 1:

A novel method for Handwritten Digit Recognition with Neural Networks

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International Journal of Computer Science and Information Technologies (IJCSIT), Vol. 2 (4) 1685-1692, 2011

Character recognition plays an important role in the modern world. It can solve more complex problems and makes humans' job easier. An example is handwritten character recognition. This is a system widely used in the world to recognize zip code or postal code for mail sorting. There are different techniques that can be used to recognize handwritten characters. Two techniques researched in this paper are Pattern Recognition and Artificial Neural Network (ANN). Both techniques are defined and different methods for each technique is also discussed. Bayesian Decision theory, Nearest Neighbor rule, and Linear Classification or Discrimination is types of methods for Pattern Recognition. Shape recognition, Chinese Character and Handwritten Digit recognition uses Neural Network to recognize them. Neural Network is used to train and identify written digits. After training and testing, the accuracy rate reached 99%. This accuracy rate is very high.

Paper 2:

Handwritten digits recognition with artificial Neural Network

K. Islam, G. Mujtaba, R.G. Raj, H.F. Nweke

2017 International Conference on Engineering Technology and Technopreneurship (ICE2T)

In a computer vision system, handwritten digits recognition is a complex task that is central to a variety of emerging applications. It has been widely used by machine learning and computer vision researchers for implementing practical applications like computerized bank check numbers reading. In this study, we implemented a multi-layer fully connected neural network with one hidden layer for handwritten digits recognition. The testing has been conducted from publicly available MNIST handwritten database. From the MNIST database, we extracted 28,000 digits images for training and 14,000 digits images for performing the test. Our multi-layer artificial neural network has an accuracy of 99.60% with test performance.

Paper 3:

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 abstraction of the central nervous system and works as 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 human brain. Like 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 of researchers in the field of artificial neural networks. We can distinguish among handwriting of different persons due to the fact that human brain is capable to even slight variations of visual images. 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 perceptive capability of neural network. In the proposed system, a very simple design of artificial neural networks is implemented. First of all, learning mechanism of the neural network is described and then its architecture is discussed. Proposed network is trained in supervised manner using various (approx.: 250) patterns/fonts of handwritten digits. Unique token is allocated to digit when it is made input to the system. Network becomes adaptive when different patterns of the same digit are taught to the network for one particular token.

Paper 4:

Artificial neural network classification for handwritten digits recognition

Mohammed Hussein Naji Jabardi, Harleen Kaur

International journal of advanced research in computer science 5 (3), 2014

Handwritten recognition is very powerful technology to support many applications comes in the forefront of automated sorting of letters and bank checks, and help the blind and Who have difficulty to read books and magazines, and the translation of books from one language to another, and converted to texts can store and processed in the computer. This paper is present two artificial neural network classification for handwritten digit recognition (from 0 to 9) with accuracy more than 98% by using an application of feed-forward multilayer neural network with two different classifiers (Forward Multilayer Neural Network FMNN and Binary Coding Neural Network BCNN). The highest recognition reliability and minimal error rate for the recognition of handwritten digits have been achieved. The back propagation algorithm minimizing the total error of the network over a set of training by searching of the weight value that achieves the objective. Binary coding approach is used to reducing the number of output that it leads to reducing the time that need for processing and saving the resources and finally reduce the network's.

Paper 5:

Neural Network Based Handwritten Digits Recognition-An Experiment and Analysis

MJ Islam, QMJ Wu, M Ahmadi, MA Sid-Ahmed

International Journal of Computer and Electrical Engineering 1 (2), 221, 2009

Handwritten digit recognition has become very useful in endeavors of human/computer interaction. Reliable, fast, and flexible recognition methodologies have elevated the utility. This paper presents an experiment and analysis of the Neural Network classifier to recognize handwritten digits based on a standard database. The experimental setup implemented in Matlab determines the ability of a Multi-Layer Neural Network to identify handwritten digit samples 5-9. This network is the representative for recognition of remaining digits 0-4. We consider not only accurate recognition rate, but also training time, recognition time as well as the complexity of the networks. The Multi-Layer Perceptron Network (MLPN) was trained by back propagation algorithm. Network structures vary with the hidden units, learning rates, the number of iterations that seem necessary for the network to converge. Different network structures and their corresponding recognition rates are compared in this paper to find the optimal parameters of the Neural Network for this application. Using the optimal parameters, the network performs with an overall recognition rate 94%.

Paper 6:

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 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 7:

Offline handwritten character recognition using improved back-propagation algorithm

Ashok Kumar, Pradeep Kumar Bhatia

International Journal of Advances in Engineering Sciences 3 (3), 1-6, 2013

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. Character recognition is gaining interest and importance in the modern world due to its application in various fields. Handwritten character recognition is a very difficult problem due to great variation of writing style, different size and shape of the character. Accuracy and efficiency are the major parameters in the field of handwritten character recognition. Neural network is a technique used to improve the accuracy and efficiency of the handwritten character recognition system. This paper throws light on the improved neural network technique to recognize the offline handwritten characters.

Paper 8:

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 propagated neural network and trained it with a set of handwritten digits. The average success rates of recognition of all digits are 91.2%.

Paper 9:

Character Recognition Technique using Neural Network

Harshal Bobade, Amit Sahu

International Journal of Engineering Research and Applications 3 (2), 1778-1783, 2013

Character Recognition (CR) has been extensively studied in the last half century and progressed to a level, sufficient to produce technology driven applications. The preprocessing of characters comprises bounding of characters for translation invariance and normalization of characters for size invariance. Now, the rapidly growing computational power enables the implementation of the present CR methodologies and also creates an increasing demand on many emerging application domains, which require more advanced methodologies. In this paper an attempt is made to develop neural network strategies for the isolated. Handwritten English characters (A to Z. a to z). The preprocessing of characters comprises bounding of characters for translation invariance and normalization of characters for size invariance. First, an overview of CR systems and their evolution over time is presented. Then, the available CR techniques with their superiorities and weaknesses are reviewed. Finally, the current status of CR is discussed and directions for future research are suggested. The variability in a character introduced by the rotation and deformation is the main concern of this paper. This variability has been taken into account by devising a neural logic based approach using normalized angle features. Now, the rapidly growing computational power enables the implementation of the present CR methodologies and also creates an increasing demand on many emerging application domains, which require more advanced methodologies. This material serves as a guide and update for the readers, working in the Character Recognition area, remove noises and feature extraction. Special attention is given to the off-line handwriting recognition, since this area requires more research to reach the ultimate goal of machine simulation of human reading.

Paper 10:

Handwritten character recognition using neural network

Chirag I Patel, Ripal Patel, Palak Patel

International Journal of Scientific & Engineering Research 2 (5), 1-6, 2011

Objective is this paper is recognize the characters in a given scanned documents and study the effects of changing the Models of ANN.

Today Neural Networks are mostly used for Pattern Recognition task. The paper describes the behaviors of different Models of Neural Network used in OCR. OCR is widespread use of Neural Network. We have considered parameters like number of Hidden Layer, size of Hidden Layer and epochs. We have used Multilayer Feed Forward network with Back propagation. In Pre-processing we have applied some basic algorithms for segmentation of characters, normalizing of characters and De-skewing. We have used different Models of Neural Network and applied the test set on each to find the accuracy of the respective Neural Network.

Paper 11:

Recognition of handwritten text: artificial neural network approach

Apash Roy, NR Manna

International Journal of Advanced and Innovative Research (2278-7844) 2 (9), 2013

Due to its wide application area and inherent complexity, handwritten character recognition grabs great interest of various researchers since long. The task is much more challenging when it comes in the form of handwritten text document. This work is an approach towards recognition of handwritten texts through competitive neural network. One way of segmenting texts into individual character is also revealed here. Text inputs are converted into binary matrices and are segmented into small pieces to find out probable individual characters from the text. Identified character matrices are normalized into standard sizes, and recognized using an artificial neural network and finally displayed them into an appropriate text editor with some font.

Paper 12:

Offline handwritten character recognition techniques using neural network: a review

Vijay Laxmi Sahu, Babita Kubde

International journal of science and Research (IJSR) 2 (1), 87-94, 2013

This paper presents detailed review in the field of Off-line Handwritten Character Recognition. Various methods are analyzed that have been proposed to realize the core of character recognition in an optical character recognition system. The recognition of handwriting can, however, still is considered an open research problem due to its substantial variation in appearance. Even though, sufficient studies have performed from history to this era, paper describes the techniques for converting textual content from a

paper document into machine readable form. Offline handwritten character recognition is a process where the computer understands automatically the image of handwritten script. This material serves as a guide and update for readers working in the Character Recognition area. Selection of a relevant feature extraction method is probably the single most important factor in achieving high recognition performance with much better accuracy in character recognition systems.