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Pattern Recognition and Dynamic Character Using Neural Network

[1]Manoj Kumar
[1]Department of Computer Science & Engineering RDEC,Ghaziabad
manoj098@gmail.com

Abstract: Neural networks are a common name for artificial neural networks (ANNs). There is some similarity to a model that draws from the neurological system in biology. The links in a network are what really carry the signals. The incoming signal is increased by the related method that the connections have. Simply activating the total amount of funds When it comes to study, NN are among the most fascinating and difficult topics. Hardware implementation of ANN is anticipated to occur when they develop into commercial systems. Consequently, the system in which they are integrated relies on their fault tolerance and dependability to operate. A combination of a back propagation network and a hopfield network is used to eliminate input distortion in the pattern recognition system. This system is able to provide precise results because of the Hopfield network's great fault tolerance.

Keywords: *Pattern Recognition; Hopfield network; Back Propagation Network; Training Set*

Introduction

Nonlinear information processing systems called Neural Networks (NNs) are built from linked basic processing units called neurons [1]. An NN could be a distributed, massively parallel processor with an innate tendency to save and make usable experimental data. Clusters or teams of neurons that are chemically or functionally related make up a biological NN. In a network, a single nerve cell might have connections to several different neurons, and there is an extensive variety of neurons and connections overall.Axons and dendrites normally form connections called synapses. The dendrites and membrane of a neuron include synapses, which allow messages to reach the cell's interior.A NN is often an adaptive system that changes its structure as it learns. NN may be used to simulate complex input-output interactions or to discover knowledge patterns [2].

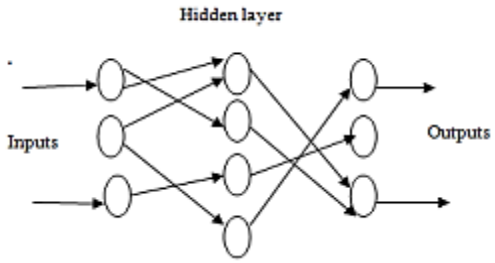

Figure 1 Basic network structure

The main characteristics of neural networks are that they need the power to find out advanced nonlinear input/output relationships, use successive coaching procedures, and adapt themselves to the information [2]. As ANN mature into industrial systems they're probably to be enforced in hardware. Their fault tolerance and reliability are so very important to the functioning of the system during which they're embedded [3]. This new approach to computing conjointly provides an additional graceful degradation throughout system overload than its additional ancient counterparts. ANN is an informatics system. During this information system the elements known as neurons process the data [1]. Artificial nerve cell is characterised by

Architecture (connection between neurons)

Training or learning (determining weights on the connections)

Activation function

Pattern recognition

Engineering and the hard sciences (e.g., biology, psychology, and medicine) rely on machines to identify, describe, categorise, and group patterns advertising, computer vision, automation, and remote sensing [2]. Images of fingerprints, cursive words, faces of personalities, or signals of speech are all examples of patterns. Identifying such items is a huge feat in the realm of artificial intelligence, even if the recognition notion is simple and known to everyone in the real world. Unlike any artificial machine or software system, the human brain is very practical. [4] Pattern recognition covers a wide range of data processing problems of practical importance, including voice recognition, text categorization, machine failure detection, and medical diagnosis. Identifying tangible objects and abstract concepts are the two main types of recognition [5]. Knowledge acquisition and pre-processing, knowledge illustration, and higher cognitive process are the three main components of a pattern recognition system's appearance. The choice of sensor(s), preprocessing method, illustration topic, and, therefore, the model of higher cognitive process are all dictated by the matter domain. Nearly everyone agrees that a well stated and suitably artificial recognition problem may lead to a simple higher-level cognitive process approach and a compact pattern illustration.In his study, Husam Ahmed Al Hamad [1] analysed the outcomes of four distinct types of artificial neural networks. All were subjected to the same algorithmic rule using a neural-segmentation methodology as the first of two primary methods, and a replacement fusion equation as the second.

In his study, Husam Ahmed Al Hamad [1] analysed the outcomes of four distinct types of artificial neural networks. All were subjected to the same algorithmic rule using a neural-segmentation methodology as the first of two primary methods, and a replacement fusion equation as the second.

In order to recognise the superior model, neural approaches compute the arrogance values for each Prospective Segmentation Point (PSP) use the intended classifiers.boosted the overall script recognition performance.

By combining three neural confidence levels, the fusion equation determines an appraisal for each PSP. We also provided the CPU timings and accuracy together. According to Jayanta Kumar Basu et al., [2], the statistical method has received the most amount of attention and has seen the most application out of all the conventional techniques to pattern detection. Attention to detail is required when planning a recognition system's architecture with respect to the following aspects: pattern representation, sensing environment, feature extraction and selection, cluster analysis, classifier design and learning, training and test sample selection, and performance evaluation. Emerging and new uses for pattern recognition include data mining, online searching, multimedia data retrieval, face recognition, and cursive handwriting recognition. Summarising and comparing some of the well-known strategies utilised in different phases of an ANN pattern recognition system was the purpose of this review work. Images of unconstrained handwritten words may have their letter boundaries identified using a robust technique that was reported by FajriKurniawanet. al., [3]. Vertical contour analysis formed the basis of the method that was suggested.

By evaluating the vertical contours from right to left, the presegmentation was generated using the proposed technique. The results demonstrated that the suggested algorithm could successfully identify the letter borders

for unrestricted handwriting. The authors of Lupus Dung et. al., [4] intended for a pattern recognition neural network to be trained with a set of biases and weights within the context of supervised training in order to categorise all patterns within the coaching knowledge set. However, this might be challenging if the neural network is unable to acquire a big coaching knowledge set. In this research, the author mapped out a method of coaching and a type of pattern recognition neural network that could accurately identify all of the coaching patterns without being too large. To identify all coaching patterns, dominate rejection recognition, and reduce mistake rate, the coaching approach helps the neural network find not one but several sets of weights and biases. Neural networks (NNs) are an effective tool for pattern recognition, according to Dilruba et al. [5]. When compared to other methods, the success rate for identifying both known and undiscovered patterns was very high. This research compares and contrasts the ways NN identifies patterns from training data and whether or not testing data also contains such patterns. The author had chosen the back-propagation strategy among many others for gaining from coaching expertise. In order to extract features, a feed-forward network applied a back propagation rule.

The author has used two ways and trained the network with that information. The author's goal in writing this article was to find a quantifiable relationship between the coaching pattern, the testing pattern, and the outcome knowledge set gleaned from the experiment. That Urdu chemical was designed by Zaheer Ahmad et. al., [6]. Because Urdu is a cursive language that moves from right to left and because letters change size and form depending on where they are in a word, robust methods for character recognition are necessary for its development. Two primary components make up the created system: classification and segmentation. To find words in a phrase and compound/connected word joints for segmentation, the segmentation section measures the strength of pixels. Verifying the rule for compound character segmentation was the primary goal of the system. Using Neural Networks, Kauleshwar Prasad et al. [7] zeroed down on the English letters in a very provided scanned text document. Its many uses include assisting the visually impaired to read, processing bank checks, and transforming any sort of handwritten document into a structured text format. First, we acquired the non-inherited scanned image. Then, we smoothed and normalised the image, filtered out noise, and rendered it suitable for segmentation, dividing it into sub pictures as needed. When training a neural network to recognise and categorise written characters, the author makes use of an algorithmic programme that extracts characters and recognises edges. Binu P. et al., [8] use wave energy features (WEF) and extreme learning machines to reduce the popularity of handwritten Malayalam characters. Derived by wave rework, the wave energy (WE) is a novel and robust parameter. At various intensities, it may reduce the impact of various noise types.

At various sizes, we may mirror the WE distribution of characters in various directions. We often use multiple decomposition levels that are able to distinguish between character images. For categorization purposes, these choices reflect patterns of written characters. When it came to feed forward neural network words, this algorithm learnt a lot faster than older in-style learning algorithms. In order to find the edge sites that would minimize an energy function, the authors of this paper—Dawei Qi et al., [9]—

suggested framing the edge detection issue as an optimization process. The conventional edge algorithm was used to first estimate an initial edge. The neuronal state of the Hopfield neural network was defined as the grey value of the picture pixel. The state will be updated until the energy function reaches its minimal value. The end outcome of the edge detection process was the representation of the neuronal states. The network converged and achieved a near-optimal solution thanks to the new energy function.

Ming-ai Li et al. [10] devised a strategy to overcome the conventional distinction Hopfield neural network's multiple native minimum disadvantage. With a single stable state and an interconnection weight matrix of negative values, the modified Hopfield neural network can only operate in a highly parallel mode, causing its energy performance to drop to an absolute minimum. We used the modified Hopfield network to solve LQ dynamic optimisation management problems for time-varying systems by establishing a correlation between the network's stability and the convergence of its energy function. A controlled system performance index may be calculated by establishing an equivalency between the energy performances of the modified Hopfield network. Going from any starting point to a stable state that reflects the given optimal management vector was a process similar to operationally associated changing distinction Hopfield networks, which is why discovering LQ dynamic optimization management disadvantage was a challenge. Both the theoretical analysis and the simulation findings are in agreement.

Proposed Model

Neural networks have recently emerged as a powerful technique for pattern identification. We have looked at the success rate for both known and undiscovered patterns. It turns out to be rather high. The feature extraction is done using a feed-forward network's back-propagation method. For recognition purposes, the Hopfield model of the neural network is used [6]. This model functions as an associative memory.

In order to get a more accurate result than would be possible with either the back propagation network or the hopfield network alone, they are combined. Using a hybrid of the back propagation and Hopfield networks, this network will be able to identify numeric, alphabetic, and special characters as input. The new integrated network receives the distorted input and produces a correct output. Since the Hopfield network has a higher fault tolerance than the Back propagation network, it is used to eliminate input distortion and provide an accurate output.

Conclusion

In this present work we have implemented the Combined Network i.e. BPN and HP for pattern recognition of input patterns. In this work we have taken a sample of alphabet patterns to perform the Pattern recognition. As the initial step the image dataset is being maintained to represent different kind of character patterns. These images are trained using HP. The numbers of hidden layers are not fixed and are dependent on the complexity of the input. As fault tolerance of HP is more than BPN so the error calculating capability is more in HP. So the new defined network of HP and BPN is most suitable for recognizing the input pattern as compared to BPN. With distortion the accuracy level of output is more in new defined network as compared to only BPN. The output we get is similar to the trained dataset

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