Identifying Datasets by Pattern Recognition Techniques using Neural Networks

Bosubabu Sambana
Assistant Professor,
Dept.of CSE, Avanthi's Research Technological Academy,
Jawaharlal Nehru Technological University - Kakinada, Andha Pradesh, India
E-mail: bosukalam@gmail.com

Abstract - **The process of Pattern Recognition neural network is found to be an effective tool. Different combinations of neural networks are used for this technique. Earlier works are based on only back propagation network but the proposed work is based on the combination of Hopfield network and Back propagation network. The success rate for recognizing known and unknown pattern is relatively very high with this combination of networks when compare to other techniques. As the fault tolerance of the Hopfield network is more than back propagation so required percentage accuracy of output of the new combined network should be more as compared to only back propagation network. The objective of the neural network is to transform the inputs into meaningful outputs. The signals are transmitted by the means of connections links. It is inspired by the character set nervous connected system. We proposed new techniques for better character set reorganization using various implementation methods evolution analysis and identification needs. It is very helpful and vast scope for future research.**
Keyword*:* Pattern Recognition, Hopfield network, Back Propagation Network, Training Set, Fault Tolerance.

I. INTRODUCTION

This paper gives a scope of possible way, the current state and possible future directions for Identity verification and identification is becoming increasingly popular. Initially a Biological Neural Network consists of a bunch or teams of with chemicals connected or functionally associated neurons. One somatic cell could also be connected to several alternative neurons and therefore the total range of neurons and connections in an exceedingly network could also be in depth. Connections known as synapses are sometimes fashioned from axons to dendrites.

Natural somatic cells receive signals through synapses set on the dendrites or membrane of the neuron. Once the signals received area unit robust enough to surpass an exact threshold the somatic cell is activated and emits a sign although the axon. This signal may well be sent to a different conjugation, and would possibly activate alternative neurons. In most cases a NN is an adaptive system ever-changing its structure throughout a learning part. NN are used for modelling complicated relationships between inputs and outputs or to search out patterns in knowledge.

Basically a biological neuron receives inputs from alternative sources and combines them in how to perform a typically nonlinear operation on the result so output the ultimate result. The figure one shows a simplified biological neuron and also the relationship of its four parts. Within the human brain a typical neuron collects signals from others through a bunch of fine structures referred to as dendrites. The neuron sends out spikes of electrical activity through a protracted and skinny stand referred to as a nerve fibre that splits into thousands of branches.
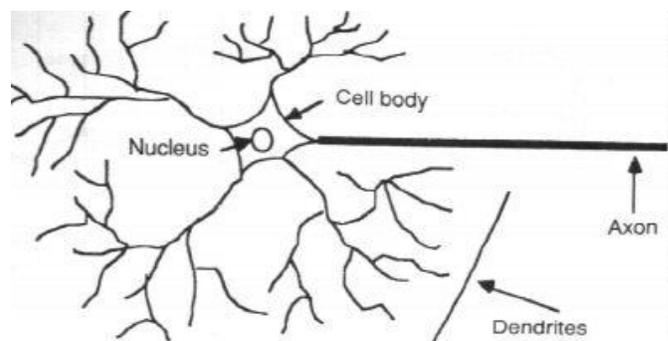

Fig.1 Biological neuron

At the top of every branch there's a structure referred to as a colligation converts the activity from the nerve fibre into electrical effects that inhibit or excite activity within the connected neurons. Once a neuron receives excitant input that's sufficiently massive compared with its repressive input. Those are identified different networks include:

1. Single layer feed forward network
2. Multilayer network
3. Feed Forward neural network
4. Recurrent network

Single Layer Feed Forward Network: The simplest quite NN could be a Single Layer Perception (SLP) network, which consists of one layer of output nodes; the inputs square measure fed on to the outputs via a series of weights. The total of the merchandise of the weights and also the inputs is calculated in every node. During this single-layer feed forward NN, the network's inputs are directly

connected to the output layer perceptions. Input nodes or units square measure connected to a node or multiple nodes within the next layer. A node within the next layer takes a weighted total of all its inputs.

$$\text{Summed input} = \sum i \, Wi \, Ii$$

Multilayer Network: A multilayer feed forward NN is an interconnection of perception's within which knowledge and calculations flow during a single direction, from the input file to the outputs. A multilayer feed forward NN consists of a layer of input units, one or a lot of layers of hidden units, and one output layer of units. A NN that has no hidden units is termed a Perception. The structure includes a layer of process units i.e. the hidden units additionally to the output units. These networks are referred to as feed forward as a result of the output from one layer of neurons feeds forward into consequent layer of neurons.

Feed Forward Neural Network: A feed forward NN could be a biologically impressed classification rule. It consists of an oversized variety of easy neuron-like process units organized in layers. Each unit during a layer is connected with all the units within the previous layer. During this network the data moves solely in one direction i.e. forwards: From the input nodes knowledge goes through the hidden nodes and to the output nodes. There are not any cycles or loops within the network. These associations aren't all equal; every connection could have a special strength or weight.

The weights on these connections cipher the data of a network. Usually the units during a Neural Networks are referred to as nodes. Information enters at the inputs and passes through the network layer by layer till it arrives at the outputs. Throughout traditional operation there's no feedback between layers. This is often why they're referred to as feed forward neural networks. Feed forward networks will be created from differing kinds of units' e.g. binary McCulloch- Pitts neurons the best example being the perception. Continuous neurons oft with colon activation are employed in the context of back propagation of error.

Recurrent Network: A repeated Neural Network (RNN) could be a category of Neural Network wherever connections between units type a directed cycle. This creates an interior state of the network that permits it to exhibit dynamic temporal behavior. Not like feed forward NN, RNNs will use their internal memory to method capricious sequences of inputs. The human brain could be a RNN i.e. a network of neurons with feedback connections. It will learn several sequence process tasks or algorithms or programs that aren't learnable by ancient machine learning ways. A RNN includes a cyclic of its connections.

Numerous characteristics of RNN are:

1. All BNN square measure repeated mathematically, they implement energizing systems.
2. Several varieties of coaching algorithms.

3. Theoretical and sensible difficulties are prevented by sensible applications to date.

Pattern Recognition: The term pattern recognition encompasses a large vary of knowledge process issues of nice sensible significance, from speech recognition and also the classification of written characters, to fault detection in machinery and diagnosing. The act of recognition will be divided into 2 broad categories are recognizing concrete things and recognizing abstract things.

The popularity of concrete things involves the popularity of spatial and temporal things. Pattern recognition will be done each in traditional computers and neural networks. This technique can provide result as affirmative or NO. That's why this is often an easy technique. The speedily growing and out there computing power, whereas sanctioning quicker process of big knowledge sets has conjointly expedited the required utilization of elaborate and numerous ways for knowledge analysis and classification of existing environment[4]. At an equivalent time demands on automatic pattern recognition systems are rising staggeringly owing to the provision of enormous databases and rigorous performance needs i.e. speed, accuracy, and cost.

II. BACKGROUND

We are easily understanding typical concepts of any content then the below words are helpful for better results of concept.

A.Pattern Recognition: Pattern recognition is a branch of machine learning that focuses on the recognition of patterns and regularities in data, although it is in some cases considered to be nearly synonymous with machine learning.

B.Hopfield Network: It is a recurrent neural network having synaptic connection pattern such that there is an underlying Lyapunov function for the activity dynamics. Started in any initial state, the state of the system evolves to a final state that is a (local) minimum of the Lyapunov function.

C.Back Propagation Network: It is used to find a local minimum of the error function. The network is initialized with randomly chosen weights. The gradient of the error function is computed and used to correct the initial weights. Our task is to compute this gradient recursively.

D.Training Set: It is a set of data used to discover potentially predictive relationships. A test set is a set of data used to assess the strength and utility of a predictive relationship. Test and training sets are used in intelligent systems, machine learning, genetic programming and statistics.

E.Fault Tolerance: Fault tolerance is the property that enables a system to continue operating properly in the event

of the failure of (or one or more faults within) some of its components.

III. RELATEDWORK

Husam Ahmed Al Hamad [1] steered that using an economical neural network for recognition and segmentation improved the performance and accuracy of the results, additionally to cut back the efforts and prices. This paper investigates and compared results of 4 completely different artificial neural network models. The neural techniques calculate the boldness values for every Prospective Segmentation Points (PSP) using the planned classifiers so as to acknowledge the higher model that increased the recognition results of the written scripts. Electronic equipment times and accuracies were conjointly according. Kauleshwar Prasad *et al*., [2] steered that recognition of written text had been one in all the active and difficult areas of analysis within the field of image process and pattern recognition. It had various applications that embrace reading aid for blind, bank cheques and conversion of any hand written material into structural text type. During this paper the author targeted on recognition of English alphabet during a given scanned text document with the assistance of Neural Networks.

The author use character extraction and edge detection rule for coaching the neural network to classify and acknowledge the written characters. Yingqiao Shi *et al*. [3] introduced the applying standing of the ANN technology within the print character recognition so elaborate on the technology of normal BPN. By formula derivation the author showed that customary BPN exists some defects within the application so the author take the approach by adding a momentum term to enhance the Network and will increase the coaching speed.

Second the author at random elect two hundred written number-characters and fifty written letter-characters as a sample of the improved BPN experiments the results showed that the strategy of the number-character recognition rate more than the alphabetic characters the performance of convergence speed and recognition was higher. Binu P. *et al.,* [4] deled with the popularity of hand written South Dravidian character using wavelet energy feature (WEF) and extreme learning machine. The riffle energy (WE) could be a new and sturdy parameter and was derived using riffle remodel. It might cut back the influence of different varieties of noise at different levels. The author tends to might replicate the WE distribution of characters in many directions at completely different scales. The standard learning algorithms of various classifiers square measure so much slower than needed.

Therefore the author had used a very quick learning rule referred to as ELM for single hidden layer feed forward networks (SLFN). This rule learned a lot of quicker than ancient common learning algorithms for feed forward neural network. Fajri Kurniawan *et al.,* [5] conferred a sturdy rule

to spot the letter boundaries in pictures of at liberty written word. The planned rule was supported vertical contour analysis. The planned rule was performed to come up with pre-segmentation by analysing the vertical contours from right to left. The unwanted segmentation points were reduced using neural network validation to enhance accuracy of segmentation.

The results showed that the planned rule capable to accurately locating the letter boundaries for at liberty written words. Jayanta Kumar Basu *et al*.,[6] planned that among the varied ancient approaches of pattern recognition the applied math approach had been most intensively studied and employed in observe. a lot of recently, the addition of artificial neural network techniques theory are receiving vital attention.

The look of a recognition system needs careful attention to the subsequent issues: definition of pattern categories, sensing surroundings, pattern illustration, feature extraction and choice, cluster analysis, classifier style and learning, choice of coaching and take a look at samples and performance analysis. The target of this review paper was to summarize and compare a number of the well known ways employed in numerous stages of a pattern recognition system using ANN and establish analysis topics and applications that were at the forefront of this exciting and difficult field. Dawei vitality *et al*., [7] planned that the sting detection downside during this paper was developed as an optimization method that sought-after the sting points to attenuate an energy perform.

The dynamics of Hopfield neural networks were applied to resolve the optimization downside. An initial edge was initial calculable by the strategy of ancient edge rule. The grey worth of image constituent was represented because the neuron state of Hopfield neural network. The state updated until the energy perform bit the minimum worth. The ultimate states of neurons were the result image of edge detection. The novel energy perform ensured that the network converged and reached a near-optimal answer. Taking advantage of the collective procedure ability and energy convergence capability of the Hopfield network, the noises were removed. The experimental results showed that the planned technique might get a lot of vivid and a lot of correct edge than the standard ways of edge detection. Zaheer Ahmad et al., [8] planned that Urdu compound

Character Recognition could be a scarcely developed space and needs sturdy techniques to develop as Urdu being a family of Arabic script was cursive right to left in nature and characters amendment their shapes and sizes once they were placed at initial, middle or at the top of a word. The developed system consists of 2 main modules segmentation and classification. Within the segmentation part pixels strength is measured to find words during a sentence and joints of characters during a compound/connected word for segmentation. within the next part these segmental characters were fed to a trained Neural Network for

classification and recognition wherever Feed Forward Neural Network was trained on fifty six completely different categories of characters every having a hundred samples. The most purpose of the system was to check the rule developed for segmentation of compound characters.

The image of the system has been developed in MATLAB presently achieves seventieth accuracy on the typical. Manu Pratap Singh et al., [9] steered that the aim of this study was to analyse the performance of Back propagation rule with dynamical coaching patterns and also the second momentum term in feed forward neural networks. This analysis was conducted on 250 completely different words of 3 little letters from country alphabet. These words were conferred to 2 vertical segmentation programs that were designed in MATLAB and supported parts (1/2 and 2/3) of average height of words, for segmentation into characters. These characters were clubbed along once finalization to create coaching patterns for neural network. Network was trained by adjusting the association strengths on every iteration by introducing the second momentum term.

This term alters the method of association strength quick and expeditiously. The conjugate gradient descent of every conferred coaching pattern was found to spot the error minima for every coaching pattern. The network was trained to be told its behavior by presenting each of the five samples (final input samples having twenty six × five = a hundred thirty letters) a hundred times to that, so achieved five hundred trials indicate the many distinction between the 2 momentum variables within the knowledge sets conferred to the neural network.

The results indicate that the segmentation supported 2/3 portion of height yields higher segmentation and also the performance of the neural network was a lot of merging and correct for the educational with recently introduced momentum term. Kothari et al. [10] planned that the rough set approach may be applied in pattern recognition at 3 completely different stages are pre-processing stage, coaching stage and within the design. This paper planned the applying of the Rough Neuro Hybrid Approach within the pre-processing stage of pattern recognition. During this project a coaching rule has been initial developed supported Kohonen network.

This was used as a benchmark to match the results of the pure neural approach with the Rough Neuro hybrid approach and to prove that the potency of the latter was higher. Structural and applied math options are extracted from the photographs for the coaching method. The numbers of attributes were reduced by hard and core from the first attribute set that result into reduction in convergence time. Conjointly the higher than removal in redundancy will increase speed of the method reduces hardware quality and so enhances the potency of the pattern recognition rule.

IV. PROPOSEDSYSTEM

Implementation
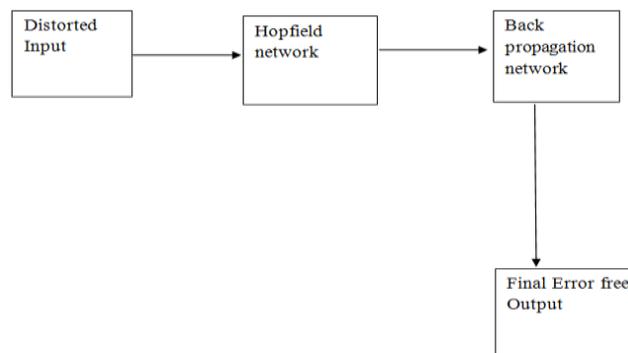
Fig.2 Proposed models

The Proposed work is presented in 4 main stages:

1. Training the Dataset
2. Input the distorted pattern
3. Matching with the training dataset
4. Compare the result of both networks

The training process will be done only once and after training a feature analysis based database will be created. This dataset is used for matching the input distorted pattern to recognize the correct pattern as output. The actual match is performed on the basis of this combined network based trained dataset. The input pattern is fed to the HP for recognition process. The input is matched with the trained dataset according to the network. The matching output will show how much the input contains error. The output of this network is fed as input to the next network. The total output is compared with the output of BPN. The total output is compared with the output of BPN.

TABLE 1 DATASET WITH DISTORTION FOR ALPHABET A

HP+BP	BP	No. of bits of distortion
100%	89%	1
100%	82%	4
48%	46%	6

The above graph shows the relation between the outputs of BP and the hybrid network (HP+BP) for one alphabet. This describes that the efficiency of hybrid network to detect

error is much more as compared to BP. The capacity to produce efficient results is more in hybrid network than BP. In this while providing input to the network the user add distortion bits which will complicate the input and shows a major change in the results while comparing with the results of inputs provided to the network without distortion bits.
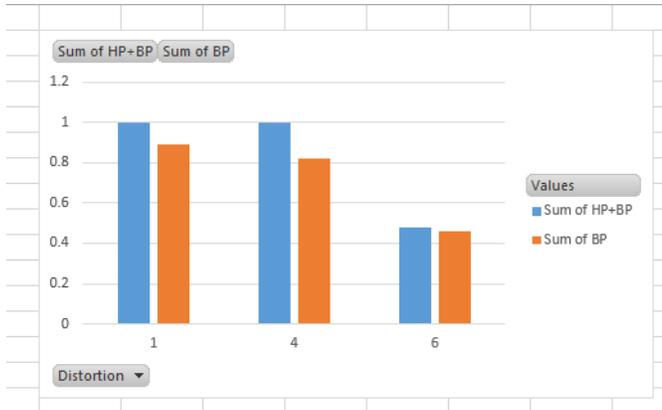
Fig.3 graphical analyses between output of bp and hp+bp for alphabet a with different distortion bits

The above figure shows the graphical analysis of our dataset, when the input is taken as distorted.

TABLE 2 DATASET WITHOUT DISTORTION INPUTS

| HP+BP	BP	Pattern
100%	84%	A
100%	97%	B
100%	96%	C
100%	82%	D
100%	94%	E
100%	92%	F
100%	82%	G
100%	96%	H
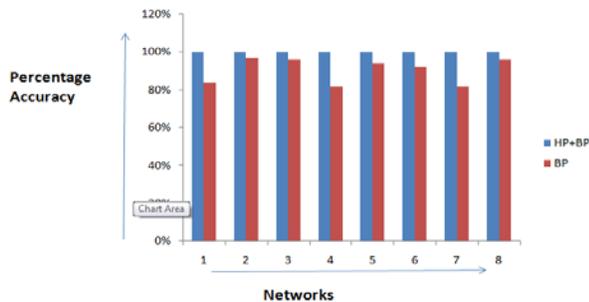
Fig.4 Graphical analysis of dataset without distortion bits

The above figure shows the graphical analysis of different alphabets using both types of networks. The input contains no distortion bits while transferring to the desired network. The distortion bit will complicate the results. There occurs a major difference between the results with distortion bits and without distortion bits.

V. CONCLUSION

We finalized this research work is done all aspects in 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.

VI. FUTURE WORK

The output we get is similar to the trained dataset. Presented Model is the best option for pattern recognition of characters. For better results further it can be extended to work with some other networks. As in this model we have considered HP and BPN so in place of HP we can use BAM network. Because the fault tolerance of the BAM is very high as HP. Also we can change the type of input pattern such as images, facial features, and cartoon characters

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