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STUDIES ON LEARNING IN SIMPLE NEURONS AND MULTILAYER PERCEPTRON USING HYDROLOGICAL FACTOR

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ABSTRACT

The objective of this study is to observe the simple learning in neuron and multilayer perception. The potential of an artificial neural network to perform simple learning in neuron and multilayer is examined. The multilayer perceptron is often quite slow, requiring thousands or tens of thousands of epochs for complex problems and simple learning in neuron is supervised learning, unsupervised learning and reinforced learning. The present study represents the possibility to observe learning in simple neurons and multilayer perceptron by using hydrological factor.

Keywords: Learnng, Perception, Hyudrological factor

1.INTRODUCTION

The multilayer perceptron is the most known and most frequently used type of neural network. On most occasions, the signals are transmitted within the network in one direction: from input to output. There is no loop, the output of each neuron does not affect the neuron itself. There are also feed-back networks, which can transmit impulses in both directions, due to reaction connections in the network. These types of networks are very powerful and can be extremely complicated. They are dynamic, changing their condition all the time, until the network reaches an equilibrium state, and the search for a new balance occurs with each input change.
Evaporation and transpiration is an essential component of the hydrological cycle, and its accurate estimation forms the basis for irrigation requirements. A new approach to determine -he reference crop Evaporation and transpiration has been proposed and developed, that employs the pattern matching capability of ANN. Evaporation and transpiration is one of the important components of the hydrological cycle. An accurate estimate of it is essential for the hydrological water-balance, irrigation, and water resources planning and management (Raghuwanshi, et al) with the emphasis of management practices for optimal use of water,crop water requirement forms a vital role in the planning,design and operation of water resource systems. Potential Evapotranspiration (PET) is defined by penman as

Evaporation and transpiration from an extended surface of short green crop, actively growing, completely shading the ground of uniform height and not short of water. Mohan used the term REF_ET instead of PET for potential Evapo transpiration of a reference crop
A large number of methods have been developed and tested for estimation of RET_ET for varying geographic and tested for estimation of RET_ET for a varying geographic and climatologic conditions from simple empirical equation to complex methods.

Rahuvanshi and Wallender, (1998) have recommended penman method for reliable estimation of REF_ET in India. Amatya et.el reported that penman method is quiet reliable when the necessary weather and vegetation data are known, but these I/P ' s are very expensive to obtain. In the present study, an attempt has been made to employ the pattern matching ability of neural networks to simplify the estimation of RET_ET. Given the preliminary nature of the research work being reported here, there will be no attempt to recommend the replacement of existing models for estimation of RET_ET based on the hypothesis of improved easiness and accuracy of the ANN models. The main purpose of the present study is to demonstrate promise and feasibility of ANN networks being applied to REF_ET estimation.

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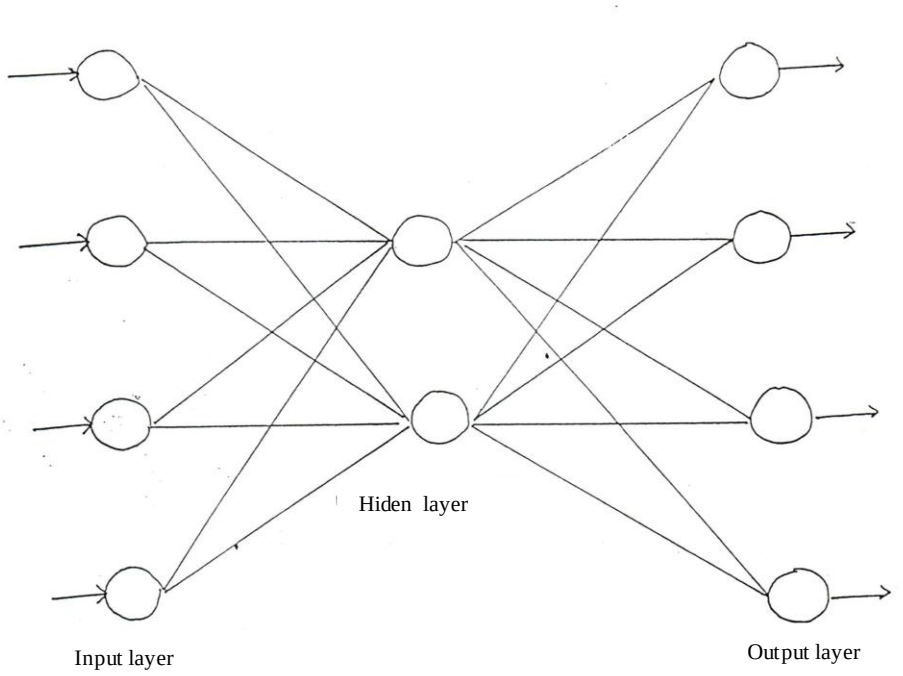

Fig.1 The Multilayer Perception

The objective of this thesis is to prepare a computer package on the operation of Penman method and reference crop Evaporation and transpiration at three weather stations. In this thesis Back Propagation Algorithm is used for the Network is trained to recognize patterns of the daily meteorological variable of weather station and their corresponding reference crop estimation, which is estimated using FAO modified penman method.

2.LEARNING IN SIMPLE NEURONS

A mechanism is needed for achieving learning in the model neuron. Connecting these neurons together may well produce networks that can do something , but the have to be trained in order to do something useful. The model neurons , connected up in a simple fashion(normally feed forward), were given the name perceptions by Frank Rosenblatt in 1962.

To include the concept of learning within the simple design, the guiding principle is to allow the neuron to learn from its mistakes. If it produces an incorrect output , then changes of that happening again is reduced; if it comes up with correct output, then has been done.

Learning, which is the core part of the neural network operation, can be broadly classified into the following types:
Learing with weight changes only:

a) Supervised learning needs a teacher to specify the desired outputs.
b) Unsupervised learning requires no teacher.
c) Graded or reinforcement learning requires a global signal (True or False)

Learning with structure changes only : Learning techniques which physically change the network topology.
For a back propagation network that involves supervised learning, the weight updation is done after minimizing the mean squared error by using recursive least square procedures

The single layer perceptron has shown success for such a simple model. It has exhibited the features of learning that are wanted to realize in a system, and has shown that it is able to distinguish between classes of objects if they are linearly separable in a pattern space (Fig. 1).

What is needed is way to overcome the restraint of linear seperatability, whilst still retaining the basic features of the model and its overall simplicity. The improvement necessary first caught large scale scientific attention in 1986 when Rumelhart and McCelland proposed their improved version , called the multiplayer perceptron.

Adding a new term is done after the update of the gradients for the weights from equations 10 and 12. The method of variable learning rate(Rumelhart et al., 1986) is to use an individual learning rate for each weight and adapt these parameters in each iteration, depending on the successive signs of the gradients [Popescu,2007)

3.THE MULTILAYER PERCEPTRON

In general, neural networks tools are characterized in three ways. First is the "architecture" of the neural network which is the particular way the slabs are interconnected and receive input and output. *Second is* the "transfer function" of the

slabs, that is the function describes the output of a neurode given it's input. Third is the "learning paradigm" used for training the network. These three characteristics can be thought of as the top level attributes of a neural network.

Choosing the activation function for the output layer of the network depends on the nature of the problem to be solved. For the hidden layers of neurons, sigmoid functions are preferred, because they have the advantage of both non-linearity and the differentially (prerequisite for applying the backpropagation algorithm)The adapted perceptron units are arranged in layers, and so the new model is naturally termed as the Multiplayer Perceptron.

This new model has three layers; an input layer, and output layer, and a layer in between, not connected directly to the input or the output and so called the hidden layer. Each input node is connected to every hidden node and each hidden node is connected to every output node. The network in which the output values can be traced back to the input values is known as feedback network. The network ordered into layers with no feedback paths. The lowest layer is the input layer, the highest is the output layer. The outputs of a given layer go only to higher layers, and its inputs come only from loyer layers. Each unit in the hidden layer and the output layer is like a perceptron unit, except that the thresholding function is the one shown in fig - 3.8 the sigmoid function and not the spot function as before.

The unit in the hidden layer serve to distribute the values they receive to the next layer, and so do not perform a weighted sum or threshold. Because of the modification the single-layer perceptron by changing the non-linearity from a step function to a sigmoid function, and added a hidden layer, the learning rule also has to be altered.

4.CONCLUSION

Neural network tool based evaporation and transpiration can possibly be accurate and by large depends on the accuaracy of the training data.

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