Neural Network Design in Cloud Computing

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ABSTRACT:

It is proposed to have a study on the diagnosis of cancer using neural network approach. Artificial Neural Network is a branch of Artificial intelligence, has been accepted as a new technology in computer science. Neural Networks are currently a hot research area in medicine. It has a huge application in many areas such as education, business, medical, engineering and manufacturing. Neural Network plays an important role in a decision support system. In this paper, an attempt has been made to make use of neural networks in the medical field along with cloud computing. A new development framework for cloud computing called User Interface Medical Services (UIMS) is formulated. Cancer diagnosis is carried out using neural networks and the implementation of cloud computing enhance the efficiency and accuracy of diagnosis.

Keyword:

Neural network,cloud computing, UIMS (user interface medical services)

1. INTRODUCTION (10 PT)

In scientific **Neurons**[1] are the basic building blocks of the nervous system. These specialized cells are the information-processing units of the brain responsible for receiving and transmitting information. Each part of the neuron plays a role in the communication of information throughout the body. Following figure below to learn more about the functions of each part of a neuron.

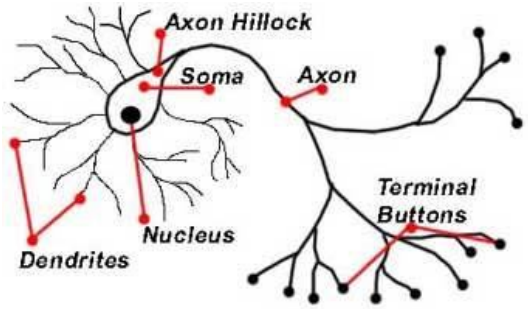

Figure 1. neuron structure

Dendrites are treelike extensions at the beginning of a neuron that help increase the surface area of the cell body and are covered with synapses. These tiny protrusions receive information from other neurons and transmit electrical stimulation to the soma.

The soma is where the signals from the dendrites are joined and passed on. The soma and the nucleus do not play an active role in the transmission of the neural signal. Instead, these two structures serve to maintain the cell and keep the neuron functional. The support structures of the cell include mitochondria, which provide energy for the cell, and the Golgi apparatus, which packages products created by the cell and secretes them outside the cell wall.

The axon hillock is located at the end of the soma and controls the firing of the neuron. If the total strength of the signal exceeds the threshold limit of the axon hillock, the structure will fire a signal (known as an action potential) down the axon.

The axon is the elongated fiber that extends from the cell body to the terminal endings and transmits the neural signal. The larger the axon, the faster it transmits information. Some axons are covered with a fatty substance called myelin that acts as an insulator. These myelinated axons transmit information much faster than other neurons.

The terminal buttons are located at the end of the neuron and are responsible for sending the signal on to other neurons. At the end of the terminal button is a gap known as a synapse neurotransmitters are used to carry the signal across the synapse to other neurons.

The biological term of neural network referred to as 'artificial neural network'. In computing language this can be defined as a computing system made up of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs. ANNs are processing devices (algorithms or actual hardware) that are loosely modeled after the neuronal structure of the mamalian cerebral cortex but on much smaller scales. A large ANN might have hundreds or thousands of processor units, whereas a mamalian brain has billions of neurons with a corresponding increase in magnitude of their overall interaction and emergent behavior.

Although ANN researchers are generally not concerned with whether their networks accurately resemble biological systems, some have. For example, researchers have accurately simulated the function of the retina and modeled the eye rather well. Although the mathematics involved with neural networking is not a trivial matter, a user can rather easily gain at least an operational understanding of their structure and function.

2. Architecture of neural networks

An artificial neuron network is a data processing system,consisting large number of highly interconnected processing elements as artificial neuron in a network structure.

2.1.single layer feed-forward perceptron

The single layer feed-forward network consists of a single layer of wights, where the inputs are directly connected to the outputs,via a series of weights. In this way it can be considered the simplest kind of feed-forward network. The sum of the products of the weights and the inputs is calculated in each node, and if the value is above some threshold (typically 0) the neuron fires and takes the activated value (typically 1).otherwise it takes the deactivated value (typically -1). Neurons with this kind of activation function are also called artificial neurons or linear threshold units.

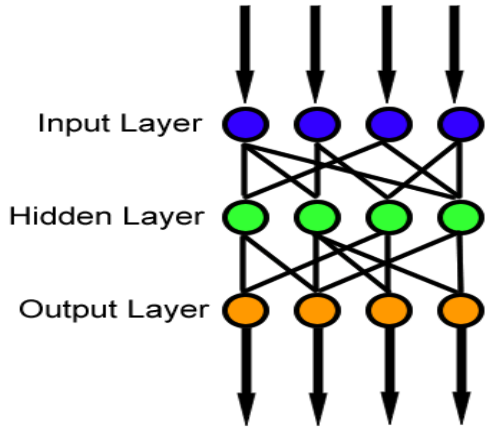

Fig2: Feed forward networks

2.2. multi layer feed-forward perceptron

Multi layer networks consists of multiple layers of computational units, usually interconnected in a feed-forward way. Each neuron in one layer has directed connections to the neurons of the subsequent layer. This architecture consists of input and output layers along with one or more hidden layers. The computational units of the hidden layer are known as hidden neurons. The input layer is directed to the hidden layer and from there to output layer. The computation is done between these two input and output layers.

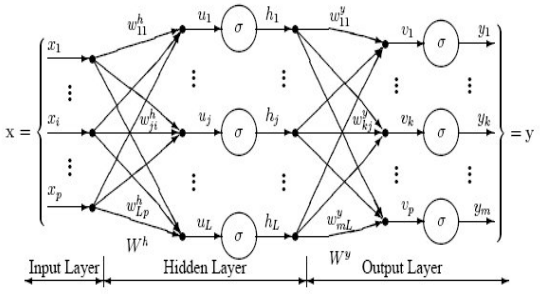

Fig3:multilayer networks

This multi layer feed forward network with 'x' input neurons, 'u' neurons in first hidden layers, 'v' neurons in second hidden layers and 'y' output neurons in the output layers is written as(x-u-v-y).

2.3. recurrent networks

The fundamental feature of a Recurrent Neural Network (RNN) is that the network contains at least one feed-back connection, so that activation can flow round in a loop. That enables the

networks to do temporal processing and learn sequences (e.g., perform sequence recognition/reproduction or temporal association/prediction).The architectures of recurrent neural networks can take many different forms, but they all share two important common features**:**

1. They incorporate some form of Multi-Layer Perceptron as a sub-system**.**
2. They exploit the powerful non-linear mapping capabilities of the Multi-Layer Perceptron, plus some form of memory.

Learning can be achieved by similar gradient descent procedures to those used to derive the back-propagation algorithm for feed-forward networks.

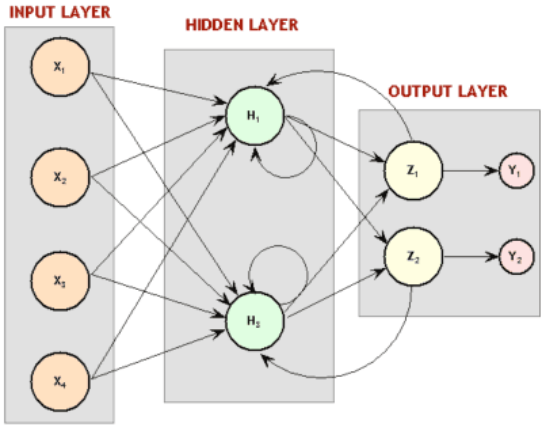

Fig4:recurrent networks

3. applications of neural networks

The neural networks are applied in various business applications in real world. They have been successfully implemented in various fields. Since neural networks are best at identifying patterns or trends in data, they are well suited for prediction or forecasting. These include Sales forecasting, Industrial process control, Customer research, Data validation, Risk management and Target marketing. In this paper we are newly applying this neural network concepts in new emerging technology namely cloud computing.

4. **cloud computing**

Cloud computing[4] is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models.

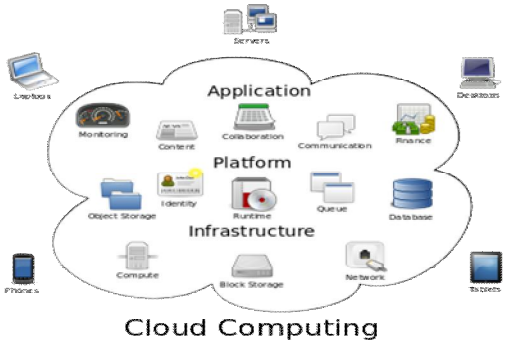

Fig5:Cloud Computing

5. cloud service models

Software as a Service (SaaS): The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user specific application configuration settings.

Platform as a Service (PaaS): The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

Infrastructure as a Service (IaaS). The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications and possibly limited control of select networking components (e.g., host firewalls).

6. proposed system for cloud neural network(cnn)

we are proposing neural network design in cloud through which we can validate all types of neural network models i.e.(single layer feed-forward perceptron,multi layer feed-forward perceptron ,recurrent network,fuzzy networks,modular neural network,linear associator ….)we are using SAAS service in cloud to implement these neural networks.

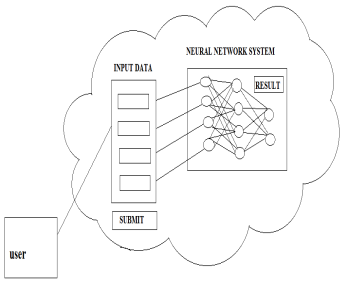

Fig6:proposed neural network in cloud

6.1 Multi –layer perceptron

In cloud this network was constructed by interconnecting several neural objects, also called components. each component has a corresponding icon and performs a specific task in the simulation of network. This proposed model can be interconnected to construct a virtually unlimited variety of neural network models. this will introduce some of these components by using this MLP(multi-layer perceptron) to solve the exclusive-or (x-or)problem. in the x-or problem, an exemplar is classified as true if one of two inputs is true, where true=1 and false=-1.

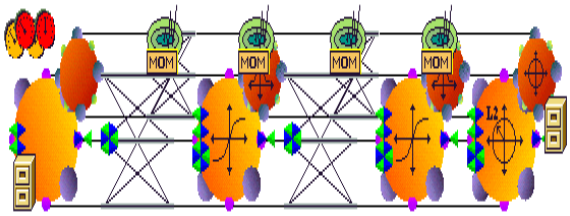

Fig7:multilayer perceptron

6.2 Fuzzy network

Below is shown a two hidden layer MLP. The MLP has problems converging to the sinc function, because the function is highly variable and locally extreme. The MLP will attempt to discover a global optimization of this function. However, due to the sinc function's localized extrema, global convergence will be slow and inaccurate And shown below are datagraphs of
1)the sinc function vs the network approximation and
2) the network mean square error.

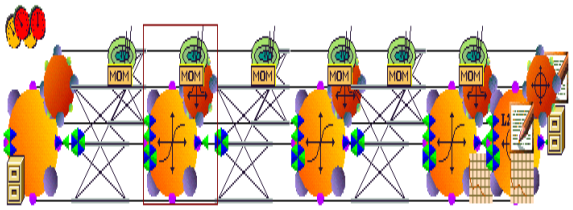

Fig8:fuzzy network

6.3Modular network

In cloud these modular networks process their input using several parallel MLP's and then recombine the results. This tends to foster specialization of function in each sub-module. In contrast to the MLP,modular networks do not have full inter connectivity between their layers and thus require a smaller number of weights for the same size network. This tends to speed up training times and reduce the number of required training examplers.

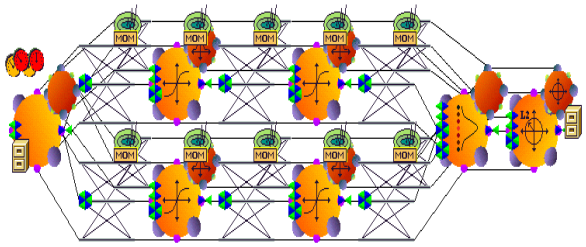

Fig9:modular network

7. Conclusion

By using cloud computing service(saas) for neural networks we can design any type of neural networks. And the outcomes for the inputs in different layered perceptrons are evaluated In cloud using SAAS(software-as-a-service) and the respective outputs are obtained easily with out maintaining any softwares or any other in our system.

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