NEURAL NETWORK IN CLOUD COMPUTING

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ABSTRACT – The paper discusses about use of neural networks in computing environment. The use of neural network enlarges the utilization of resources available. The outline of neural network in computing environment gives solution to many reckoning problem. Artificial neural network gives prediction about storage capacity of cloud so that service provider can satisfy the customer according to service level agreement. Evaluation of the results obtained by simulation decreases SLA Violation. Security model with neural data is used to secure the computing environment.

Keywords- SLA, Quality of Service, Cloud Data Security, Hadoop, Map Reduce, Cryptography

I. INTRODUCTION

Mazin Qmar Khairo [5] proposed the use of neural network in the cloud computing environment that address the relationship between cloud computing using neural networks. Cloud computing, is a group of connected computers together each other representing the cloud from a variety or complex networks . Neural network is associated with online services on the basis of cloud computing such as the infrastructure of the system and access to Internet networks. Cloud computing is a service that can be used to send Functions and tasks available resources to Enlargement the utilization of The classification of the resources available to reach at the top of productivity in solving computational problems through neural networks.

Stefan Frey et.al [3] proposed Cloud Storage Prediction with Neural Networks that gives prediction about the storage capacity of cloud in term of size, usage and available memory that results in better acquiescence with SLA. Prediction of cloud storage minimized the reallocated resources and reduces SLA violation.

B.Rajkumar et.al [1] proposed Neural Network Design in Cloud Computing that made an attempt in which neural network is being used in computing environment for the advancement of the medical field. The framework for the development in medical field is being implemented that is known User Interface Medical Services (UIMS).

S. Jegadeeswari et.al [2] justify about the Neural data security model (NDSM) in cloud to secure computing environment from threat and maintain confidentiality and integrity of big stored data. The neural cryptographic algorithm is used in the data security model for encrypting the private data to protect it from threat. To increase the security level in cloud computing, S. Jegadeeswari et.al [2] introduce a new cryptography approach using artificial neural network.

Gibet Tani Hicham et.al [4] justify about how algorithms of neural network used to schedule the tasks in better way according to the available VM in cloud environment. It considered various neural network algorithm and compare them to evaluate their characteristics to choose appropriate algorithm for scheduling.

Ataul Aziz Ikram et.al [6] introduce the advancement of bioinformatics by implementing neural network in computing environment and gives solution to many reckoning problems and satisfies customer by providing them various resources to accomplish their task.

II. ARTIFICIAL NEURAL NETWORKS

In human brain, there are several neurons that exchange information with each other and collectively perform specific task. Each neuron transfer a signal within human brain
and human is capable of recognizing image, accomplishing a particular action.
In the same way there is artificial neural network in the computer so that it is able to accomplish particular task and recognize the specific image. ANN stores large amount of data and provide it to user accordingly to their needs. In neural network, each node in input layer maps with hidden layer and computer is capable of recognizing image and performing particular task.

III. WORKING OF NEURAL NETWORK

Neural network there is collection of several nodes called artificial neurons which accomplish the particular task by executing in parallel. These neurons exchange information from input to hidden layer and produce the target result if the result is not accurate then it back propagates to hidden layer and process the information and produce desired result. Each connection between artificial neuron can transmit a signal from one to another. The neuron receives the signal from other neuron and then processes it and produced required result [4].
Artificial neurons and connection typically have a weight that adjusts as learning proceeds. When we move forward in neural network values for weight are calculated by hit and trial method. Learning mechanism is same as human being learn things. When neural networks works, neurons interchange their weights and examine the output produced and compare it with target result if output does not match with the target result then it back propagates and weights value are adjusted to decrease the difference between target value and resulted value so that error is minimized [6].

IV. NEURAL NETWORK ARCHITECTURE

4.1 Single-layer perceptron: In this, Input layer is connected to single hidden layer through a series of weights and produced the desired result. Mazin Omar Khairo [5] considered this method as the simplest kinds of nutrition network forward.
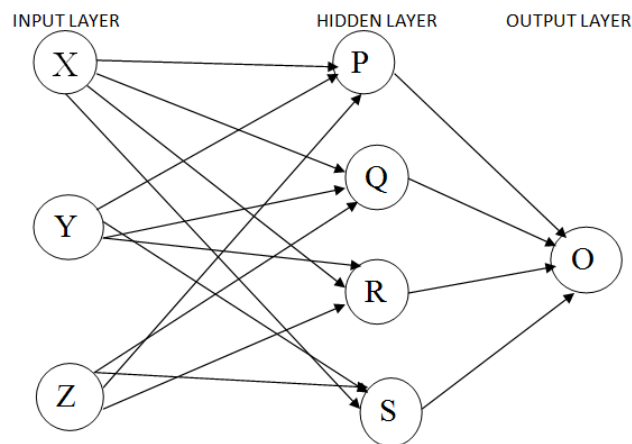
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Figure 1: Single layered network

4.2 Multi – layer perceptron: Multi-layered networks and these networks consist of multiple layers of computational units are interconnected with each other .The neuron process the signal received from other neuron and produced output. The output of a input layer is the input to the hidden layer which produced desired output.
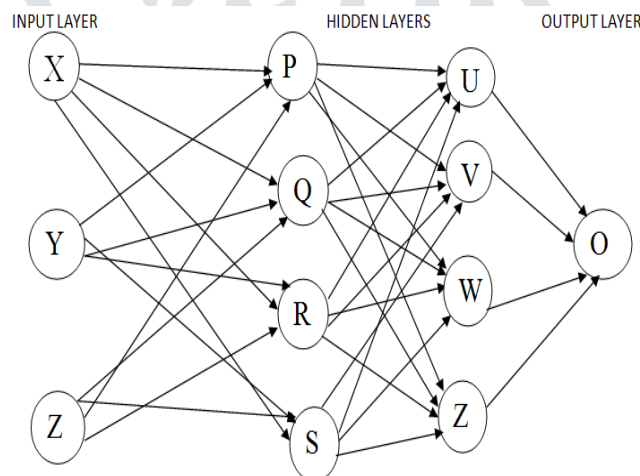

Figure 2: Multi layered Network

V. CLOUD COMPUTING ENVIRONMENT

5.1 This computing environment allows clients to use applications to perform tasks using without installing the application.

5.2 In cloud infrastructure, through virtualization over internet on demand service of resources and on running migration of process is provided. In cloud infrastructure, limited resources are paid.

5.3 Virtualization is a procedure in which single physical framework is partitioned into different isolated machines called virtual machine (VM) nodes which expands the resources according to the requirement [8].

5.4 In cloud infrastructure, virtual machine (VM) is the basic computing node. Cloud infrastructure accommodates unlimited servers due to which energy is consumed [9].

5.5 Clouds computing is dynamic computing environment in which unpredictable operation occurs which results in occurrence of faults that later become failure.

5.6 Cloud computing uses the computational Intelligence to manage and analyze the big data so that information can be easily extracted and processed due to which knowledge base is build that provide data according to the user's need.
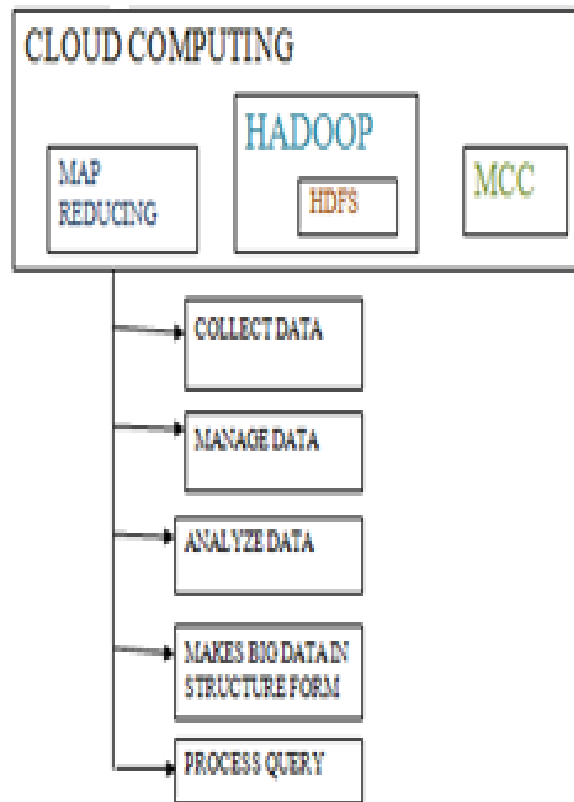
Figure 3: Cloud Computing Environment

VI. CLOUD COMPUTING CHARACTERISTICS

6.1 Shared Infrastructure: And through the use of virtualization software, which allows trying to share the physical storage services and operations, as well as infrastructure to achieve benefit from the infrastructure and it is available in many models of users.

6.2 Dynamic Provisioning: Provide services on the basis of requirements customer need through the use of drivers mechanism allowing the expansion of the service as much as we need this dynamic expansion to maintain the highest accuracy levels of security.

6.3 Network to Access: In order to access them via the Internet through a wide number of devices such as computers and mobile through the use of the views of programming standards-based applications include the deployment Most of the existing services in the cloud using business applications.

6.4 Managed Metering: This is the measure to manage and improve service and provide reports and information that consumers get the services and it allows for the exchange and dissemination services through cloud computing

6.5 SERVICE MODELS

6.5.1 (SaaS): It have the ability to reach consumers and use applications that are hosted in the cloud, where the information needed to host. The importance of the interaction between the service provided as part of the cloud and the consumer.

6.5.2 (PaaS): It have the ability to purchase platforms, That help them deploy their own software in the cloud and access to the network cannot be controlled by consumers.

6.5.3 (IaaS): They are controlling them and control the system through operating systems and most applications and storage space, as well as connect to the network but is not controlled in infrastructure. We will clarify the cloud computing services in terms of the different actions that vary depending on the client's requirements models.
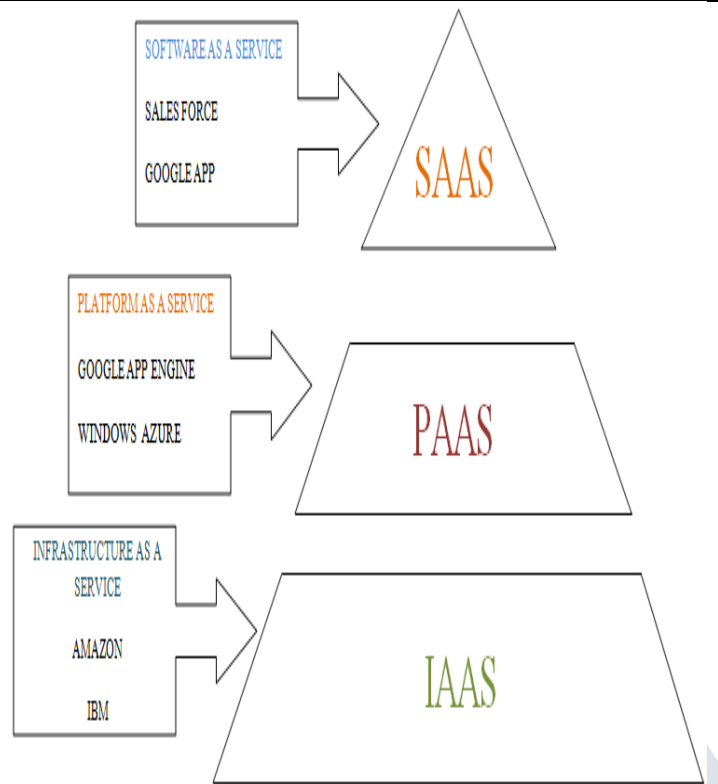
Figure 4: Cloud Computing Layered Architecture and Delivery Model

VII. FORMS OF CLOUD COMPUTING

7.1 Cloud of public: Be available to the public by the intra infrastructure and be on a commercial basis that will allow consumers to spread and develop cloud service but fiscal spending will be very small compared with capital spending .

7.2 Private Cloud: In this there is limited deployment of cloud infrastructure for a certain facility This process may be used at home with presence of a third party. Companies like Toyota, Citi bank and Wal mart have their own private cloud.

7.3 Community Cloud: In this there is the sharing of infrastructure for many organizations with common interests and this can help to reduce costs and capital expenditures as share of these costs between organizations.

7.4 Hybrid Cloud : Here's infrastructure consists of a number of clouds that are working on the composition of the cloud move from cloud to another cloud, and this is a cross between the clouds private and public clouds, which is working to support these data in the organization as well as the provision of services in the cloud .

In Fig 4, the graph shows that the private cloud is private to their own premises and service provider has more control over it whereas the public cloud makes services available to every user who pays for it and service provider has less control over it as it is highly scalable. Hybrid cloud combination of both public and private cloud is highly scalable.
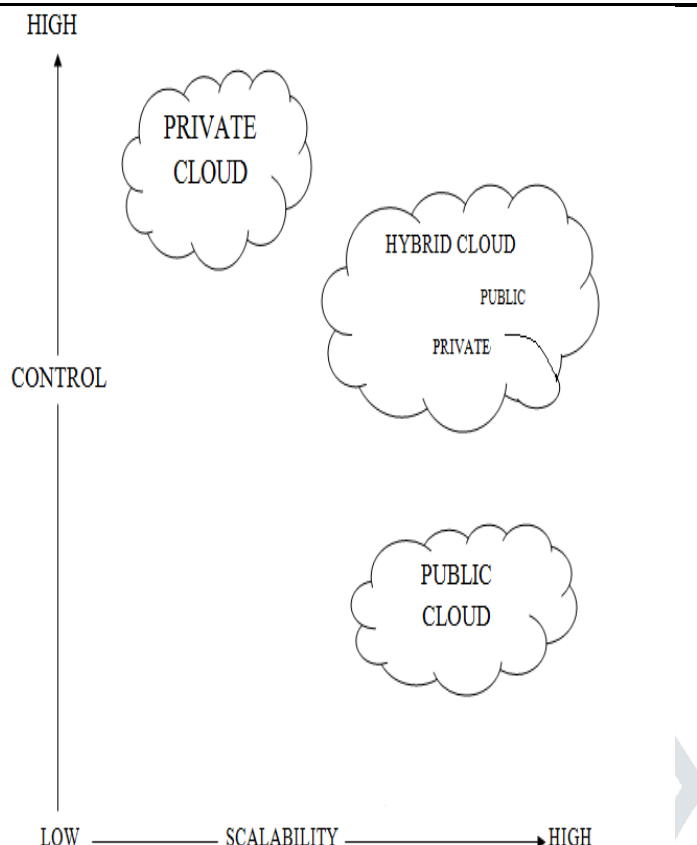
Figure 5: Forms of cloud computing

Moreover Cloud Computing consist of the parts which are attached with the other cross the Internet network (Front part and back part) as shown in fig 6 .The front part is the user part of the vision, which has the ability to connect with cloud computing and will also talk about the back which allows all the storage, servers, to submit the final application for users Using the internet and the software.
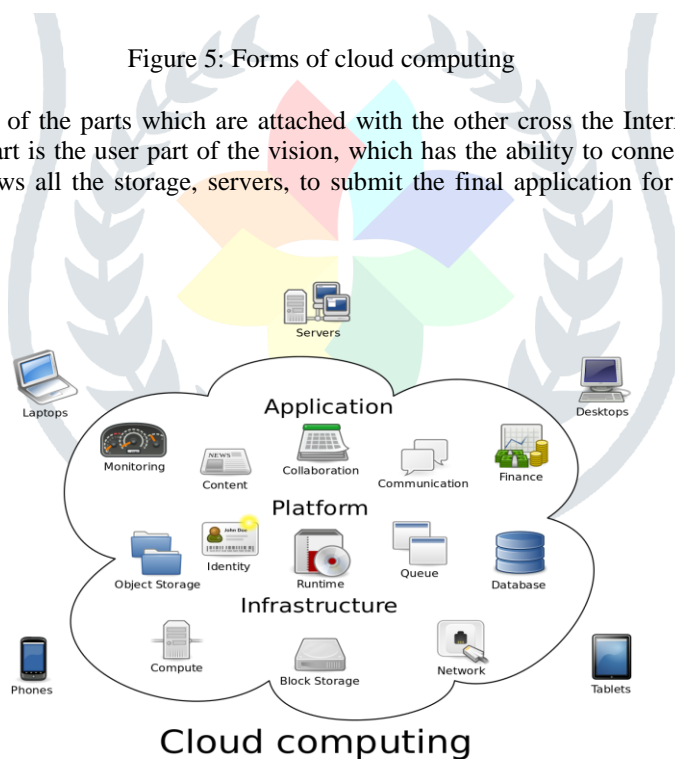

Figure:6 Cloud Computing architecture

VIII. PROPOSED SYSTEM FOR CLOUD NEURAL NETWORK

Neural network in cloud environment gives prediction about the storage capacity of cloud that reduces SLA violation. Neural network is being used in computing environment for the advancement of the medical field. Neural data security model (NDSM) in cloud is used to secure computing environment from various threat like cyber attack, data breaches, etc. Algorithms of neural network are being used to schedule the tasks in better way according to the available VM in cloud environment. By implementing neural network in computing environment gives solution to many reckoning problems and satisfies customer by providing them various resources to accomplish their task. Multilayer perceptron, fuzzy network and modular network is proposed in cloud environment as shown in fig 7 [12].
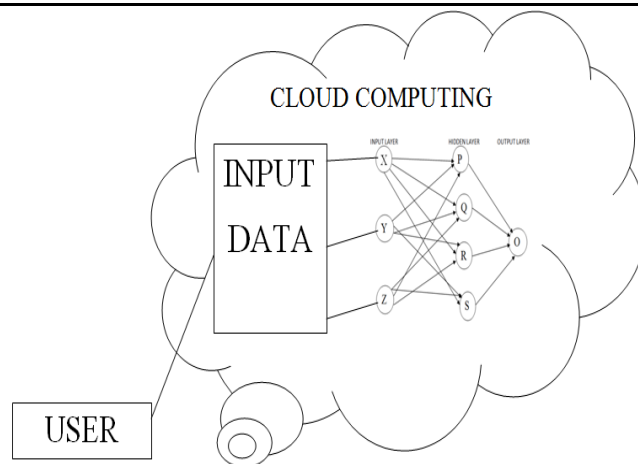
Figure 7: Proposed system for cloud neural network [12]

8.1 Multi layer perceptron: In this, there is multiple hidden layers in which each neural component of one layer is connected to each neural component of other layer. Every neural component accomplish particular task. This Multilayer network when implemented in cloud environment it gives solution to many reckoning problems like exclusive-or problem [12].
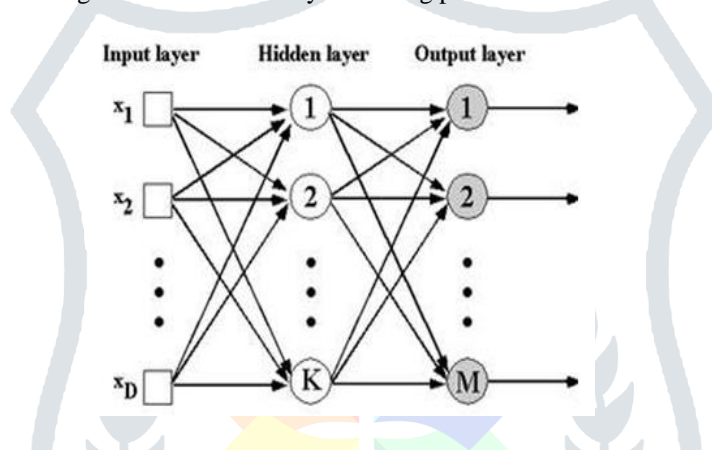

Figure 8(a): Multilayer perceptron [12]

8.2 Fuzzy network: As the function is highly variable and locally extreme many problems related to sinc function occurs in multilayer perceptron that results in slow and inaccurate global convergence. The sinc function vs the network approximation and the network mean square error is shown in Fig 8(b).
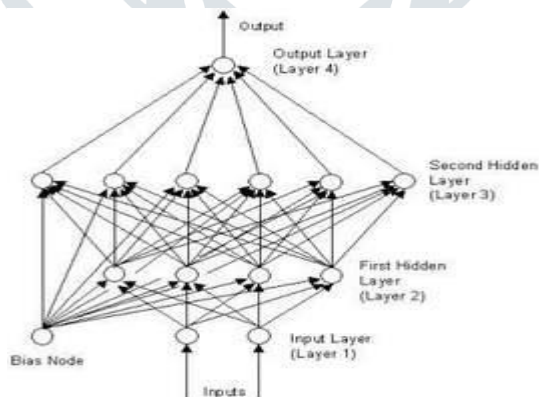

Figure 8(b): fuzzy network [12]

8.3 Modular network: Separate input is provided to each module (neural network) to perform specific subtasks to accomplish complete task. Output of each network is given to intermediary so that it can produce desired result. Using several parallel MLP's these modular networks process their input in cloud environment and produce desired results. Modular network require a smaller number of weights for the same size network as it do not have full inter connectivity between their layers. This results in reducing the required number of training examples [12].
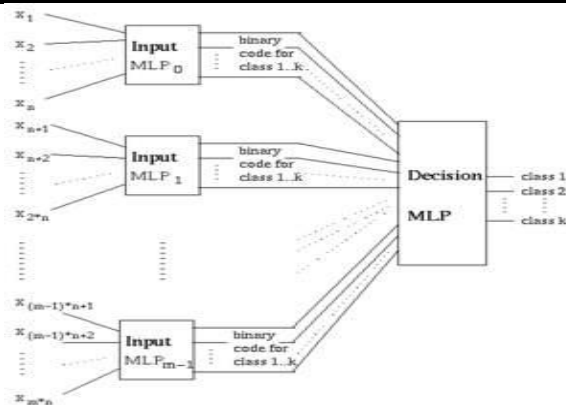
Figure 8(c): Modular network [12]

IX. DESIGN AND ARCHITECTURE OF CLOUD BASED NEURAL NETWORK

Cloud computing incorporates hadoop, map reduce and mobile cloud computing that combines with neural network and provide on demand service to its user.

9.1 HADOOP: It is tool used for storing, analyzing and processing big data. It uses Apache Hadoop distributed storage file system. is programming segment for Cloud Computing joined with map reducing to handle big data.HDFS is a superior software component for cloud computing that handles big data. HDFS is used for reliable storage and processing of large amount of data [10]. It act as a master slave architecture that provides high throughput access Namenode is a master node that handles the incoming client request. Datanode is a slave node in which blocks of data are store [11].

9.2 HDFS Architecture : Hadoop Distributed File System (HDFS) is used for holding large amount of data. It includes Name node that maintain the large data in files. File is divided into large blocks of data and these blocks of data are replicated throughout the HDFS architecture so that data can be easily recovered. Slave node is data node that actually stores blocks of data send it to name node [6].
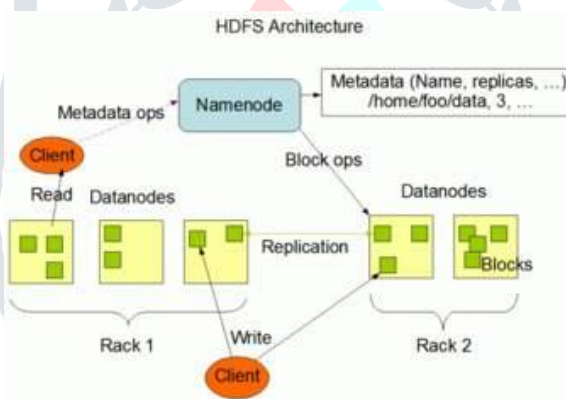

Figure 9: HDFS Architecture

9.3 MAP REDUCE Map reduce is used for distributing processing of big data. It performs function on data in form of (key, value) pairs. Firstly, it maps the value to every key present in data. Secondly, data is shuffled and sorted and at last reduce function is performed. It handles complex data by reducing it as shown in figure 10 [15].
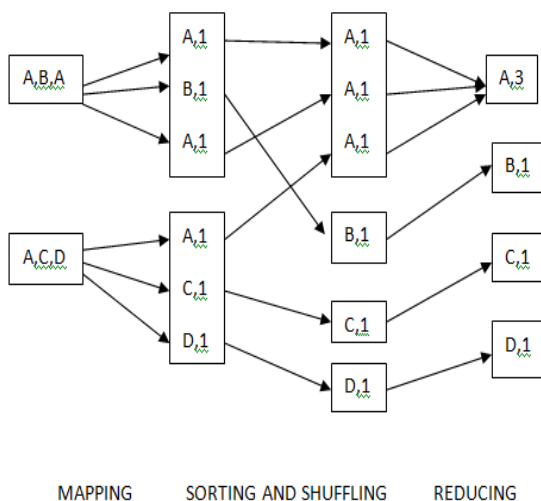

Figure 10: Map Reduce Functions Process [15]

9.4 COMBINING HADOOP MAP REDUCING AND NEURAL NETWORK:
In map reducing, it is easy to implement neural network so that the large data is reduced by reducing function and then reduced data can be easily recognized using map reducing structure as shown in fig . Mapping function is implemented by mapping name node to data node. Cloud services are being incorporated in neural network for holding and retrieving large data and this stored data is used for making decisions. Genetic functions are used for giving input of chromosome to map reducing framework. Multiple DNA's chromosome are being process using DNA pattern searching. Jobs are processed in parallel using advanced technologies like neural network to produced result in less time. For example, Sequence alignment is included in Neural Network and generates the desired results in less than 30 minutes. If these jobs are processed in sequence then create the desired results in more than 12 hours [6][15].
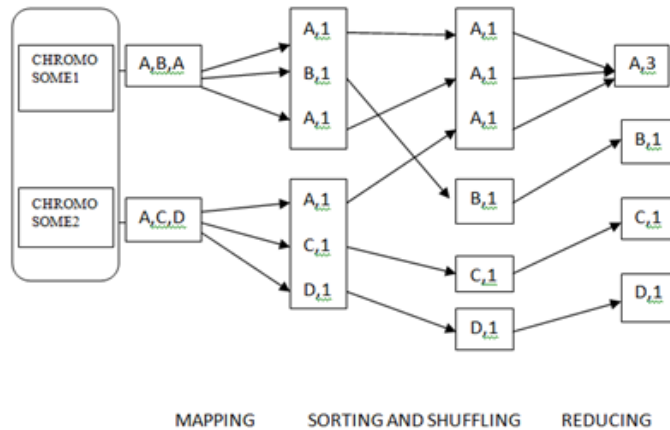

Figure 11: NEURAL NETWORK AND MAP REDUCING

X. CLOUD STORAGE PREDICTION USING NEURAL NETWORK

Artificial Neural Networks gives prediction about the storage capacity of cloud in term of size, usage and available memory that results in better acquiescence with SLA and avoid the occurrence of fault in computing environment [13].

SLA is a formal contract between service provider & consumer used to guarantee that consumer's service quality expectation can be achieved. Customer satisfaction depends upon the Quality of service which is known as service level objectives (SLOs) and this is provided by service provider. SLO include Key Performance Indicators (KPIs) that contain metrics and the particular value. In order to improve the Quality of service for cloud computing services. Quality of service monitoring, allocating approach, recognition and prediction approach is used to avoid SLA violation and improve Quality of service. Artificial Neural network examine the cloud storage continuously and metrics are also continuously monitored so that service level objectives are met and SLA is protected from being violated. In this way artificial neural network predict about cloud storage and balance the load in computing environment. This work used to determine that use of Artificial Neural Network in cloud computing enable better utilization of resource contrast to threshold value system and create effective results. For this the simulation environment was created in which it sent a read, write and delete request through quality of service module where the granted by ANN and threshold system as shown in figure 12 [3].
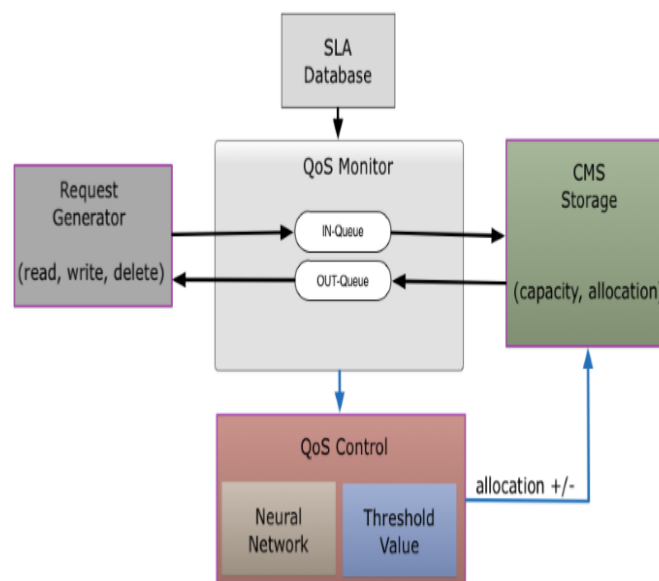

Figure 12: Simulation environment [3]

Key performance indicators after this simulation are indicated as:
10.1 It provide an required amount of memory for cloud storage.
10.2 In this simulation, an immediate response is given to a client request thus reducing response time.
10.3 It provide backup in case of failure in computing environment.
10.4Neural network values are compared to check SLA violation [14].

XI. CLOUD COMPUTING BECOMES MORE SECURE USING NEURAL NETWORK

Neural network is used in computing environment to make it more secure to every customer and protect customer data and services from any threat by using appropriate security techniques. Sensitive data of cloud customer is kept private by using dynamic hashing fragmented component (DHFC). When data is inserted and deleted DHFC enlarges and reduces automatically. Cryptography uses Neural Data Security model to protect the sensitive data by using asymmetric encryption techniques that uses public and private keys for encryption and decryption of private data. Security model gives effective and efficient result and make computing environment more secure by protecting confidential data. The figure 13 shows that user request query to store and query information in cloud environment and this information are spitted into fragments which are encrypted by using neural data security model [2].
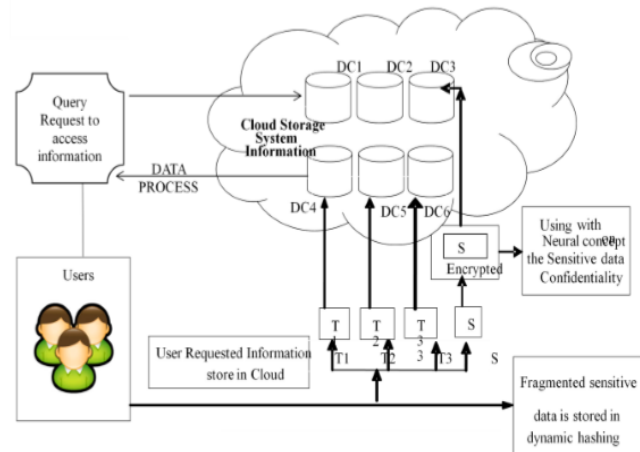

Figure 13: Sensitive data protected using neural data security model [2]

XII. CONCLUSION

This paper discusses that the use of neural networks in cloud computing provide knowledge and solution to the reckoning problem that are faced by cloud customer. Major advantages are that neural network use neural data security model to secure the confidential data. Artificial Neural network used in computing environment to reduce SLA violation and it also reduces the time in hadoop distribution by using parallel processing. In future, the more benefits of using neural network in computing environment will be discussed.

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