Analysis of Network By Graph And Fuzzy Logic

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Abstract- *In the present paper we discuss some application of Graph which is useful to solve the current networking problem. Generally Graphs are mathematical structures that have many applications of computer science, electrical engineering and more widely to engineering as a whole, but also to sciences such as biology, linguistics, and sociology, among others, as an example, relations among objects can usually be encoded by graphs. Whenever a system has a notion of state and state transition function, graph methods may be applicable. Certain networking problems are naturally modeled by undirected graphs whereas others require directed graphs. The problem requires finding a directed graph. There is a peculiar aspect of graph theory having to do with its terminology. A wide range of networking problems can be expressed with clarity and precision in the concise pictorial language of graphs.*

In the present paper we discuss some basic properties of a graph, which can be used independently and provide efficient solutions for net work, we also discuss some properties and applications of the various types of graph and tree, with the help of fuzzy logic which helps to solve current network problem and solved through simulations equation and matrices provide some optimum solution. Fuzzy logic and neural network provide new method for designing control system and can start with an approximate control knowledge base and refine it through enforcements learning. Fuzzy logic and Artificial Intelligence and Neural Network plays an important role to solve many real world applications, and their complex pattern recognitions problems and describe features of the brain basic for new secure processing model.

I. INTRODUCTION

Most of the Neural Net work in initial stage depends on neuron and its properties and structure is most typical and complex and not notices by the human being as well as computers. They are regularly used to model parts of living organisms and to investigate the internal mechanisms of the brain. The field of geometrical representation (graph) has received increasing interest in the last years. Although it is fairly subjective that the perception of how good a graph is in conveying information, The most crucial problem as far as readability of a graph is that of edge crossing . Directed acyclic hierarchical graphs are also known as layered digraphs, hierarchical digraphs, or simply hierarchies. A hierarchical digraph is a drawing where the vertices are constrained to lie on a set of equally spaced horizontal or vertical lines called layers and all arcs flow in the same direction .In the paper we also discuss some properties and applications of the various types of graph and tree, with the help of fuzzy logic which helps to solve current network problem and solved through simulations equation and matrices provide some optimum solution. To express this problem as a graph, use one vertex for each exam and put an edge between two Nodes (vertices) if there is a conflict, that is, if there is somebody taking both endpoint exams Fundamental properties of the basic network connectivity structure of a graph. It also finds explicit paths to these nodes (vertices), summarized in its search tree. Path lengths allow to transits from one node to other node, the extent to which different vertices of a graph are separated from each other. Assumes a new level of activation, and sends an output signal to the units to which it is connected. Interconnection networks used for processor-memory communication are often required to perform simultaneous connections for many input–output pairs. In this Paper, an irregular, multi path network named “Modified Four Tree-New Network” has been studied and its probability analysis has been carried out. Also, a comparison has been performed among different MINs to find out which is better in context of which parameter. For the Probability Analysis, probability equations for MFT have been derived. The parameters involved here are Bandwidth, Probability of Acceptance, Cost and Bandwidth per unit cost. The expressions for probability equations of all the stages of the MFT have been derived and the parameters Bandwidth, Probability of Acceptance, Cost and Bandwidth per unit cost are computed on the basis of these equations. Bandwidth of MFT is compared with the bandwidth of some of the regular and irregular MINs. Bandwidth per unit cost is derived by simply dividing the bandwidth of MIN by the cost factor of the corresponding MIN. A neural N/w in a directed graph consisting of nodes with inter connecting synaptic and activation links which is characterized by four properties. Each neuron is represented by a set of linear synaptic links, an externally applied bias and possible non linear activation links. This bias in represented by a synaptic link connected an input fixed a t +1.The synaptic link of a neuron weight their respective input signals. The weight sum of the input signals defines the induced local field of neuron is question. The

activation link charges the induced local feels of the neuron for producing output complete directed graph a. graph directed is said to be complete if it describes not only the signal flow from the neuron to neuron. But also the signal flow inside the each neuron. Partially complete directed graph-use to reduce from any graph by omitting the details of signal flow inside the individual neuron such as directed graph is known as partial directed graph. An important goal for many problems solving system is to collect the evidence as the system goes along and to modify its behavior on the basic of evidence. To model of this behavior ,needs a Bayesian statistic as in the fundamental notion of conditional probability, for it consider the probability of hypothesis H for given and observed evidence E than the prior probability of H (the probability that assigns to H if no evidence) and the extents to which E provides evidence of H. For it consider a defined universe of exhaustive, mutually exclusive set of Hi`s among which try to discriminate. Then let P(Hi/E) = Probability that the hypothesis Hi is true given evidence E.P(E/Hi) = Probability of the evidences E given the hypothesis I is true .P(Hi)= The prior probability that the hypothesis I is true in the absence of any specific evidence. These probabilities are called prior probabilities let k= the number of possisible hypothesis Bays theorem than states that

P(Hi/E)=P(E\Hi).P(Hi)/∑ P(E\Hn).P(Hn)

Most information is not obtained personally but got from sources on which in has a lot of behalf ,uncertainty prevails when the source does not send the information in time or the information provided is not understand.

1. In various experiments one takes it for granted that the equipments is properly calibrated and error free.
2. Experimental errors like parallax errors also sources of uncertainty
3. Impression in regular language is also source of uncertainty. This is well exhibits in situations when the assert speaks something and the listeners understand some thing
4. A random event occurring is a major source for uncertainty. To handle these information probability technique is used, which provide a path way to express the confidence, it is express in terms occurrences an non occurrences of total trials, for mutually exclusives events the product theorem of probability holds good .how ever most of the event are independent upon one another. For these reason Bays theorem is used for the computations of probabilities.

II. Definitions

The flow of signals in the various parts of the graph have three basic rules

1. **Rule 1**- A signal flows along a link only in t he direction defined by the arrow as the link. There in two type of links.

Synaptic links:- It's behavior governed by linear input-output relation and the node signal X^T multiplied by synaptic weight w to produce the node signal y.

$$X \to Y, Y = X^T * W$$
$$X = (x_i - x_k), W = (w_i - w_k)$$

Activation link:-It is the behavior governed by a non-linear input-output relation. Here f (net) in the non linear activates function.

$$X \xrightarrow{f(net)} Y = f(net)$$

2. **Rule 2:-** A node signal equals the algebraic sum of all signals entering to the relevant mode via incoming link. This is known as synaptic convergence or fan in rule.

$$\left.\begin{matrix} Y_i \\ Y_j \end{matrix}\right\} \to Y_K = Y_i^+ = Y_i + Y_j$$

3. **Rule 3:** The signal at a node I s transmitted to each outgoing link origination from that node, with the transmission being entirely independent of the transfer of the function of the out going links. This is known as synaptic diver once rules or fan-out rule.

$$\mu_A(x) \in [0,1]\ x_i \to \begin{cases} x_i \\ x_{kj} \end{cases}$$

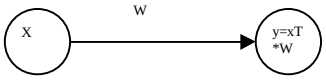
III. NEURAL NETWORK VIEWED AS A DIRECTED GRAPH

A directed graph signal flow is the most important part we can simplify the graph with a well defined set rules were developed by mason .A signal flow graph is network of directed link that are interconnected of certain points called nodes. The flow of the signal in the various parts of a graph has three basic rules.

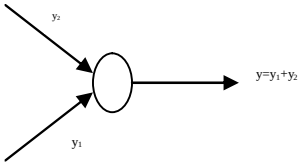
1. **Rule I -:**

A signal flow along a link only in the direction defined by the arrow on the link .There is two types of links are :

Synaptic link : It is a behavior is governed by a linear input output relation. If the node signal X^T is multiply by the synaptic weight W to produce the signal Y. let $X=\{x_1,x_2,\ldots\ldots x_n\}$ and $W=\{w_1,w_2\ldots\ldots\ldots..w_n\}$

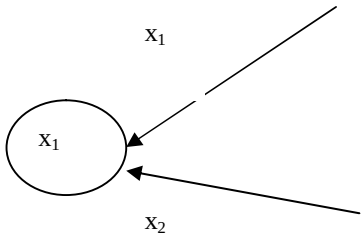


Activation Link: Its behaviour is governed by the in general by a non linear input output relaxation here f(net) is non linear activation function.



2. Rule 3:-

The signal of node is transmitted to each outgoing link originated from the node with the transmitting being entirely independent of the transfer function of the outgoing link this known as synaptic divergence of fan out rule



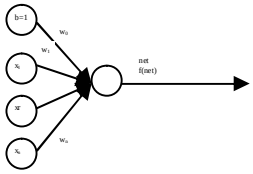
A neural network is a directed graph consisting of nodes with interconnecting synaptic activation link and activation link is characterized by four properties: Each neuron is represented by a set of linear synaptic link, an externally applied bias is represented by a synaptic connected link connected to an input fixed at (+) 1.The synaptic link of a neuron weight their respective input signals. Weighted sum of the input signals defines the induced local field of the neuron in question .The activation link changes the induced local field of the neuron to produce the output.

IV. Complete Directed Graph

A directed graph is known as complete if it describes not only the signal flow from the neuron to neuron but also the signal flow inside the each neuron.

1. Partially Complete Directed Graph:

Use reduced from of any graph by omitting the details of signal flow inside the invidiously neurons such as directed graph is known as partially directed graph



Block diagram providing a functional description of network, signal flow graph providing a complete graph description of signal flow in the network. Architectural graph , describing the network layout.

2. Why are neural network:-

Neural network with there removable ability to derive the meaning from complicated or imprecise data can be used to extract the patterns and detects trends that are to complex to be notice by either human being or other computer technique. A trained neural network can be thought of as an experts in the category of information it has been given to analyze. The expert can be used to provide the projection and other advantages includes Adaptive learning:-An ability to learn how to do tasks based on the data given for training or initial experiences.

Self organization: An ANN can create its own organization or representation of the information it receives during learning time.

Real Time Operation:-

ANN computation may be carried out in parallel and special hardware device are being designed and manufactured which take advantage of this capabilities. Fault Tolerance via Rudiment Information coding: Partial destruction of a network leads to the corresponding degradation of performance. How ever some network capabilities may be retained even the major network.

3. Neuron:-

Neuron is a morphologic and functional unit of thee nervous systems consisting of the nerve sell body. The den dries and the ax ion that conveys the electrical signal to other neurons. Synonyms of neuron are nerve, neurocyte and fearsome .A neuron can be in one of the two states firing and rest. A neuron is a nerve cell that is the basic building block of the nervous system .Neural are similar to other cells in the human body in a number of ways, but there is one key difference between neurons and other cells .Neuron are specialized to transmitted the information throughout the body. A biological neuron may have as many as 10000 different inputs and may send as the out pout the presence or absence of the select short durations spike to many other neurons Neurons are wired up to three dimensional patterns.

4. Neuron V/S other cells:-

Similarities with the other cells:

1. Neurons and other body cell contain a nebulous that holds genetic information's.
2. Neurons and other body cells are surrounded by a membrane that protects the cell.
3. The cell body of the both cells organ cells that support the life of the cell including mithocherida Golgi bodies and cytoplasm.

5. Artificial Neuron:-

The following artificial neuron propose d by Mecullah and Pitts in 1943..The threshold artificial neuron and the activation corresponding to the graded potentially is given by the formulae

$$\delta = \sum_{k=1}^{m} \left(x_j * w_j \right) + t \qquad .....3$$

The inputs weights are real .A negative value for a weight indicate an inhibitory connection while positive indicate the excitatory one .Although the biological neuron t has a negative value it may assign a positive value in artificial neuron models. If t is negative usually referred as bias. If $x_0 = +1$ with the weight $w_{0\text{-}t}$

$$\delta = \sum_{i=1}^{n} x_i * w_j \qquad ……..(4)$$

Output neuron is the function of its activation in a analogy to the firing frequency of biological neurons. x=f(a) the following vector notation for activation of the neurons

$$\alpha = w^{T*} x + t,$$

where $w^{T*}x$ represents inner product of the vector w and x that is always scalar values.

6. Taxonomy of the network:-

There are two phase of in the neural information processing. The learning phase to determine the weight parameter that defines the neural model .This trained neural model will be used latter in the retrieving phase to process read test and yield classification results.

7. Learning Phase:-

A silent features of the neural network is their learning ability .The learn by adaptively updating the synaptic weight the characterize the strength of the connection the weights are updated according to the information extracted from training ,pattern usually .The optimal weight are obtained by optimizing minimum or maximum certain energy function for example a popular criteria's supervised learning is to minimizing the least squares errors between the training values and actual output values.

8. Reviving Phase:-

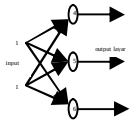
Various non linear system have been proposed for retrieving desired or stored patterns .The result can be either computed in one shot or updated iteratively dynamic equation .The final; Neuron values represent the desired output retrieve.

9. Feed forward Network:

A layered feed forward network has a layer for subgroup of processing element .A layer of processing element make independent computation of data that it receive and posses the result to another layer .The next layer may in turn make its independent computations and pass through another nodes or layer may be in turn made its independent computation and pass on the result to yet another layer. Finally a subgroup of one or more processing element determines the output from the network. Each processing element makes its computation based on the weighted sum of its inputs . Generally there is two kind of feed forward networks have been used.

10. Single layer Feed Forward Network:

It is a feed forwarded network has only one layer of weighted interconnection. in the simplest form of a layered network have an input layer of the source of nodes that projects nodes in to the out put layers of neurons but not visa versa the net work is strictly feed forwarded acyclic types. Means there is no loop in the network the input may be connected directly with the output units. Maximum and minimum values have two layers net that is one input and one output layers there is no hidden layers. Figures shows the input another is out put but it is single layers because of no computation is performed in the input layers. Input layer: In any network the first layers in the input layers ,it consists of source node



1,2-input 4,5,6 -single layer, output layering: single layered feed forward Output Layer: In any network the last layer is known as out put layers.

11. Multilayered Feed Forward Network:

It is also feed forward network the net where the signal flows from the inputs units to the output units in a forward direction .The multilayer net must have present between the inputs and the outputs layers. It can be used to solve complicated problems.

12. Hidden Layer:

The layer between the inputs and outputs signal are applied to the neurons in the second layer .The second layer is first hidden layer .The output signal of the second layer are used as input to the third layer and so on for rest of the network .The feed forward network with m-source node h1 neuron in the first hidden layer h2, neuron in the second hidden layer is n neuron in the out put layers is referred to m-h_1,-$h_{2\text{-}n}$ network.

13. Feedback network:-

Output signal back to the input of all the other neurons feedback is said to exist in a dynamic system influences in part the input is applied to the particular node, there by giving rise to one or more closed path for the transmission of signal around the system. loop feedback system where the input signal xi(n),internal signal x_j/n and output signal $y_k(n)$ are the function of discrete time variable n. The system assumed to be linear consistency of a forward path and a feedback path that are characterized by the operator A,B respectively in particularly the out put of the forward channel determinate in parts its own output the feedback signal channel.

$$y_k(n) = A_{xi}(n).....(5)$$
$$x_j(n) = x_j(n) + B * y_k(n).....(6)$$

There the square bracket are induced to emphasize that A and B act as operator eliminate xj(n) between 1& 2.

$$y_k(m) = A*(1-A_b)*[x_i(n)].....(7)$$

The loop occurs in the feed back network because of feedback connection.

V. RECURRENT NETWORK

In the process the output of a neuron is feedback in to itself as input .A recurrent neural network distinguish itself as output of neuron is feed forward neural network, in that it has at least one feedback loop.

Example: The output signal from the output put layer back to the inputs of the input layers .We can say each and every recurrent network is feed back but converse is not true. The major task for a neural net work is to learn a model of the world. Knowledge refers to stored information or model used by a person or machine to interpreter, predetects and approximately responds to out side world. The primary characteristics of knowledge representation are two types how the information is physically encoded for the subsequent use of knowledge of the world consists of the two type of information.

1) The known world state represented by facts about what is and what has been known this form of knowledge is referred to prior information.
2) Observation of the world, obtain by means of sensors designed to probe the environment in which the neural network is supposed to operate. These are four rule is generally used for knowledge representation.

1. Rule I:-

Similar inputs from similar classes should usually produce similar representation inside the network and should therefore be classified as belonging to the same category. there is some technique measure for determining the similarity between inputs are in commonly used measures on the

concepts of Euclidean distance and dot products or inner products.

Euclidian distance:

$$x = (x_{i1}, x_{i2}, ...x_{im})^T \quad \text{.....(9)}$$

Hence the T denotes the as the matrix transposition The vector x_i defines the points is an, m-dimensional space called Euclidean space defined by R_m .The Euclidean distance between pair of (m *1)
Vectors xi, xj element of input vector is defined by

$$d(x_i, x_j) = \left|x_{ik} - x_{jk}\right| = \left\|(x_{ik} - x_{jk})^2\right\|^{1/2} \quad \text{.....(10)}$$

(b) Dot product:- another measure of the similarity is based on the idea of a dot product or inner product that also borrowed from matrix algebra .Given a pair of vectors X_i and x_j of all such dimension there inner product is x^T x_j written expanded from as follows

$$\left(x_i, x_j\right) - x^T * x_i = \sum_{k=1}^{m} x_{ik} * x_{jk} \quad \text{.....(11)}$$

Rule II:- items to be cauterized to operate classes should be in given widely different representation in the network.

Rule III:- In particular features are important then there should be a large number of neurons involved in the representation of the items in the network.

Rule IV:- Prior information and in variation should be built in to the design of a neural network, thereby simplifying the network design but not having to learn them.

2. What is Neural Network

Interconnection of neurons in the neural network is based on parallel architecture of animal brain. These are used in bioinformatics to map date and make prediction .Neural network are a form of multiprocessor computer system with the following Simple processing element .At high degree of interconnections .Simple scalar massage. Adaptive interconnection between elements.

VI. FUZZY MATRIX AND FUZZY GRAPH

Given finite, discrete fuzzy sets X = {x_1, x_2, ….. , x_m} and Y = {y_1, $y_{2,.....}$, y_n},a fuzzy relation on X ×Y can be represented by an m×n matrix

$$. R = [R_{ji}] = [\mu R(x_i, y_j)]^* T \quad \text{.....(12)}$$

his matrix is called a fuzzy matrix .The fuzzy relation R can be represented by a fuzzy graph. In a fuzzy graph, all x_i and y_j are vertices, and the grade $[\mu R(x_i, y_j)]$ is added to the connection from x_i and y_j

1. Membership Function:

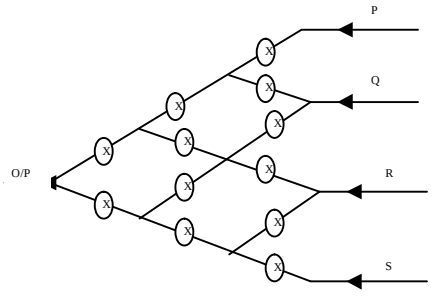
A fuzzy set A over the universe of discourse X, A : X → [0,1], is described by the degree of membership $\mu_A(x) \in [0,1]$ for each x Є X. Inimicality and normality are two important aspects of the MFs .

1) 6.5. NETWORK LAYERS:

The commonest type of artificial neural network consists of three groups, or layers, of units: a layer of "input" units is connected to a layer of "hidden" units, which is connected to a layer of "output" units.The activity of the input units represents the raw information that is fed into the network.The activity of each hidden unit is determined by the activities of the input units and the weights on the connections between the input and the hidden units.The behavior of the output units depends on the activity of the hidden units and the weights between the hidden and output units.This simple type of network is interesting because the hidden units are free to construct their own representations of the input.

2) Application of binary net :

By taking three input variable defined as follows and their matrix representation with the flow function



for the three input the Boolean out put function is obtained form the o/p and it is defined by the expression for the input node(P,Q,R,S) as follows:For the INPUT FROM P is f(x_1, x_2, x_3) = x_1* x_2* x_3 = in binary form 1*1*1 = 1 the true out put.For the INPUT FROM Q is f(x_1,x_2,x_3) = x_1* x_2* x`$_3$`+ x_1* x_2`* $x_2$+ $x_2$* $x_2$* $x_1$` = 1*1*0+1*0*1+1*1*0 =0+0+0=0 false

out put For the INPUT FROM- R is $f(x_1,x_2,x_3) = x_1* x_2`*x`3`+ x`_1* x_2`* x`_3+ x_3* x`_2* x`_1 =1*0*0+0*1*0+1*0*0 =0+0+0=0$ Result: false out put For the INPUT FROM S is $f(x_1,x_2,x_3)) = x`_1* x`_2* x`_3 = 0*0*01=0$ (False value).And the resultant flow function can be described as $F(x_1,x_2,x_3)$ =flow of P+ flow of Q+ flow or R+ flow of $SF(x_1,x_2,x_3))= x_1* x_2* x_{3+} x_1* x_2* x`_3`+ x_1* x_2`* x_2+ x_2* x_2* x`_1+ x_1* x_2`*x`_3+ x`_1* x_2* x`_3+ x_3*x`_2* x`_1+ x`_1* x`_2* x`_3$ and the matrix representation defined as follows

$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}$$

From the matrix the vector (1,1 ,1) shows the true value and (0 ,0, 0)shows false values for the resultant output.

VII. CONCLUSION

The computing world has a lot to gain from neural networks. Their ability to learn by example makes them very flexible and powerful. Furthermore there is no need to devise an algorithm in order to perform a specific task; i.e. there is no need to understand the internal mechanisms of that task. They are also very well suited for real time systems because of their fast response and computational times which are due to their parallel architecture. Fuzzy logic is knowledge representation strength of fuzzy inference system with the adaptive learning capability of neural networks. Neural networks also contribute to other areas of research such as neurology and psychology. They are regularly used to model parts of living organisms and to investigate the internal mechanisms of the brain. Perhaps the most exciting aspect of neural networks is the possibility that some day 'conscious' networks might be produced.

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