

Hybrid Neuro-Fuzzy Classification Algorithm for Social Network

Anu Sharma, M.K Sharma, R.K Dwivedi

Abstract : *People tend to build and maintain their friendship relying on SNS nowadays. Thus, the problem of how to organize the social network accurately and automatically. In this paper, a hybrid neuro-fuzzy approach is used. . Many aspect impact the error values like input/output, membership functions, the training data arrays, and the number of epochs needed to train the model. This paper is based on hybrid Neuro-Fuzzy concept for testing the link prediction for facebook data. We use Matlab to calculate average testing Error, View Generation Rule, Output Surface.*

Keywords: *Neuro-Fuzzy Approach, Social Networks, MATLAB, Fuzzy Rule, Neural Network*

I. INTRODUCTION

Recently, with the development of computer and capable devices, it is hard to imagine life without the Internet. Also, with the development of the Internet, the new communication media and technologies, SNS, which refers to Social Networking Services, have drawn more and more attention from users and researches. Online social networks allow efficient interaction between the users and the information sources. With the advent of more online social media, controlling the information access has become a major challenge.[1] As one of the most popular and successful Social Network Services, Facebook, plays an indispensable role in providing a great platform for people and friends not only to share their own feelings, but also to make new friends, maintain old ties, and deeper current relationships.[5] Social Networks are most dynamic in nature. Social networks are being created and evolving with time and expansion of new connections . Future prediction of links is a problem due to large number of variables in social network analysis. There is a need to analyze the evolution of the networks and association between the nodes. To assess the estimation of non-existent links by the known data or by making new links in Social Networks are usually defined as the Link Prediction problem. The issue that we need to handle is to predict future association between two nodes . The problem of Link Prediction is concerned with new possible connections that may connect in near future and identifying the missing connections [4][10] . We used the hybrid approach that joins fuzzy logic and artificial neural networks in one model.

Fuzzy Rule tells us about the set of membership functions.

Fuzzy inference system + Neural System= ANFIS

which provides good solution for various big data problems.[3] Social Networks can be characterized as a structure where nodes connect to individual or any other entity whose edges represent links . Such kind of networks can be explained by different graphs.

II. RELATED WORK

In R.I.M et al. work [5], they define edges and create ego network .They clustered the dataset into 4 clusters each of which is called “layer.” The frequency of contact within each layer varies depending on layers.They analyzed the data using two different clustering techniques: k-means and DBSCAN, a density-based clustering technique. They obtained similar results and declared that k-means works good enough if considering the simplicity of k-means. The work of Jaewon et al. [6] using a set of 230 large real-world social networks in SNAP. Although their research did a comparison by methods using SNAP data,they did not use any small-sized, anonymized data such as SNAP Facebook dataset. Jaewon and Jure et al. [7], they presented a method called BIGCLAM.They successfully dealt with the detection of overlapping, hierarchically nested, as well as non-overlapping communities with relatively higher accuracy.Julian et al. [8] extracted communities from both the edge structure and node attributes (CESNA). They improved the accuracy of community detection with relatively high speed. Moreover, besides detecting the communities, it can also help to find the interpretation of the detected communities. [5] Upasana Sharma et al.[4] introduce the Neuro Fuzzy Techniques. This technique identifies the weight to the nodes by considering the friend circle (up to two levels and three levels) and nodeclustering coefficient and then normalize the weight values. They discussed about the sparse or dense network. Padmaja Katta et al.[16] present fuzzy based approach for sentiment examination of negative feelings from social network content. This framework used to quantify political assessment.Vishal Sharma et .al[1] In this paper, a neuro-fuzzy based horizontal anomaly detection model is proposed that accounts for efficient detection of horizontal anomalies in online social networks.This study has considered the role of weak ties as weak nodes play a major role in social networks. Tie is the type of connection or link between the nodes and it is assessed in terms of strength.

Revised Manuscript Received on August 20, 2019

Anu Sharma¹Uttrakhand Technical University Dehradaun,India

Dr. M.K Sharma²Amrapali Institute Haldwani, India

Dr. R.K Dwivedi,³ Teerthanker Mahaveer University,Moradabad, India

Hybrid Neuro-Fuzzy Classification Algorithm for Social Network

We have assigned weight to each node to identify which node has less number of links or high number of links. A node that has less/high number of links considered as weak/strong node accordingly. These columns contain the numeric number that denotes the unique number for each person. Each row represents that the first person is the friend of the second person.

III. METHODOLOGY

We have taken the information from “www.snap.stanford.edu”. The steps of classification algorithm proposed in this research work are as follows:

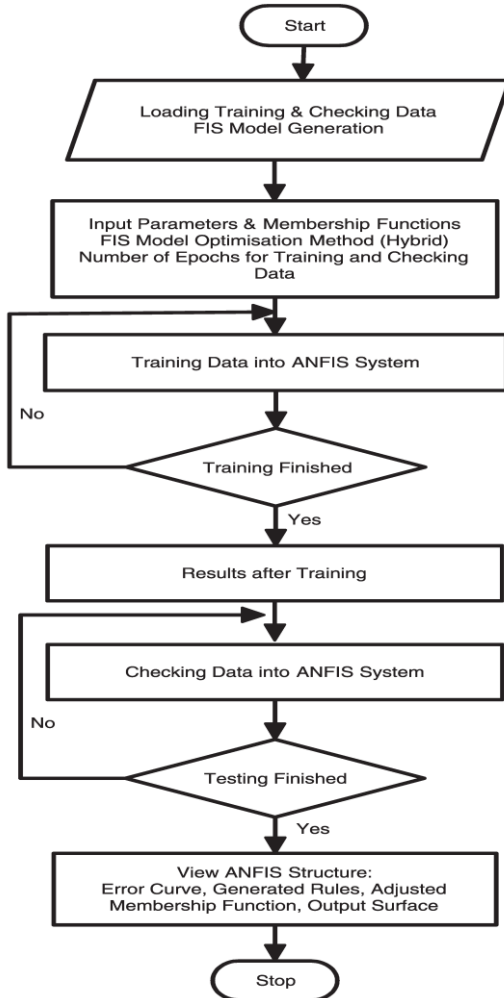


Fig 1: Workflow. [10]

Steps are as follows:

Input: social network data set

Output : Average Testing Error, Output Surface.

Step 1: Take facebook combined dataset

Step 2: Loading, Training and Testing Data using neuro fuzzy .

Step 3: Input Parameter, Membership Function, Optimization Method, Number of Epochs.

Step 4: Calculate average testing Error

Step 5: View Generation Rule, Output Surface.

IV. IMPLEMENTATION

In this research, SNAP Facebook Dataset is used. This dataset contains personal networks of connections between friends of survey participants. Such personal networks represent friendships of a focal node, known as "ego" node, and such networks are therefore called "ego" networks. In Facebook, dataset consists of 4039 nodes and 88234 edges.

A. Neuro-Fuzzy Inference Systems

The Neuro-Fuzzy Designer includes four distinct areas to support a typical workflow.

- Loading, Plotting, and Clearing the Data
- Generating or Loading the Initial FIS Structure
- Training the FIS
- Validating the Trained FIS [14]

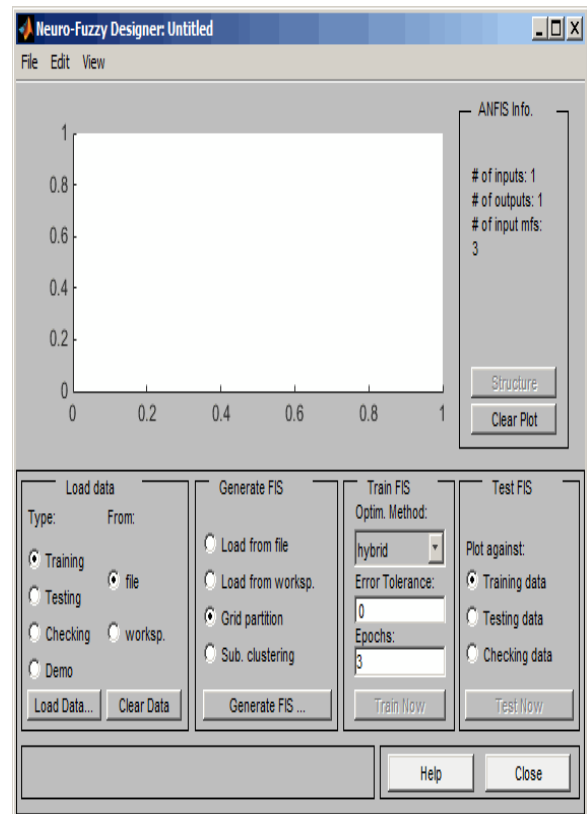


Fig 2: Neuro Fuzzy

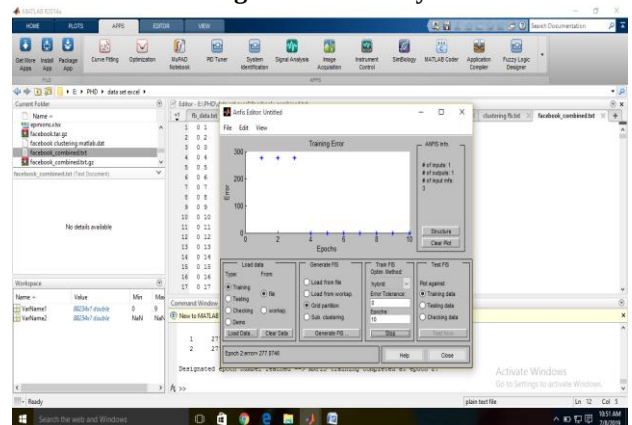


Fig 3: Trained Data

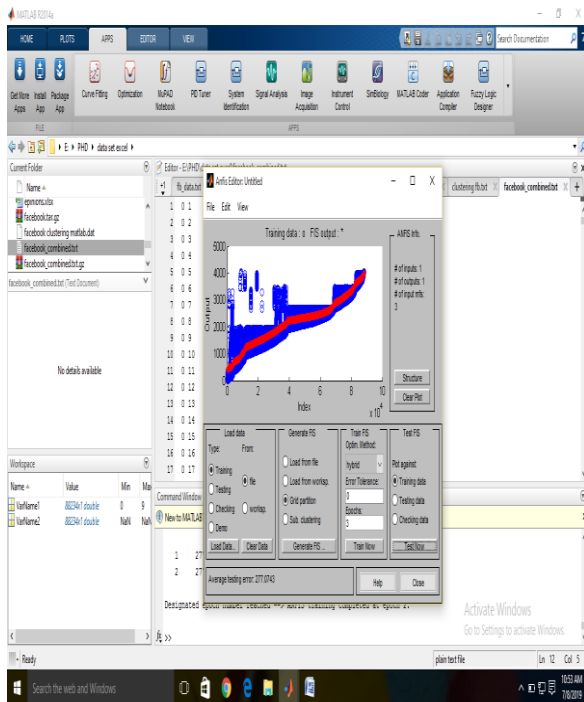


Fig 4: Test Data

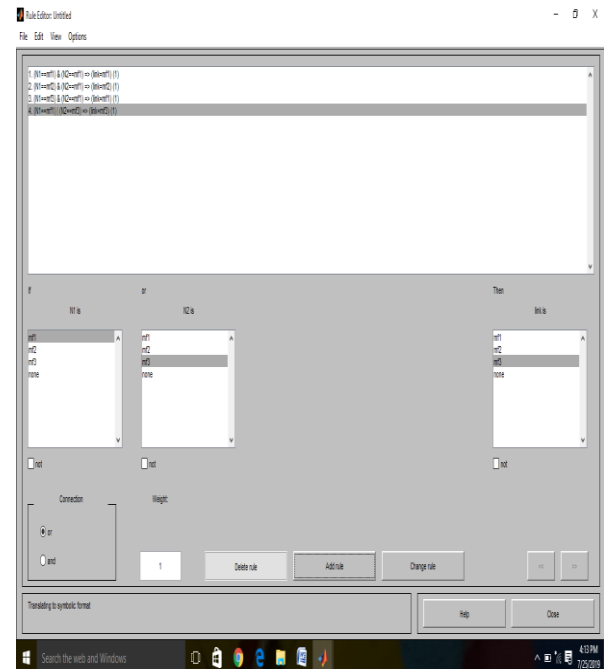


Fig 6: Apply Fuzzy Rule

Table 1: Hybrid Optimization and BackPropagation Method

Data Set Used	MF TYPE	Epochs	Hybrid Optimization Method Average Testing Error	Backpropagation Method Average Testing Error
Facebook	Trimf	10	278.5116	224.9127
	Guass2mf		277.778	277.9519
	Guassmf		276.8809	277.9519
	psigmf		277.1611	2239.9298

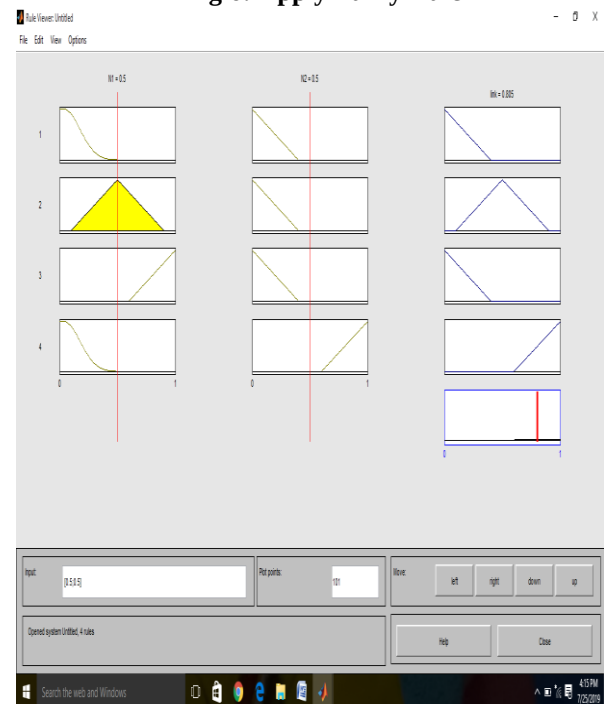


Fig 7: Rule Viewer

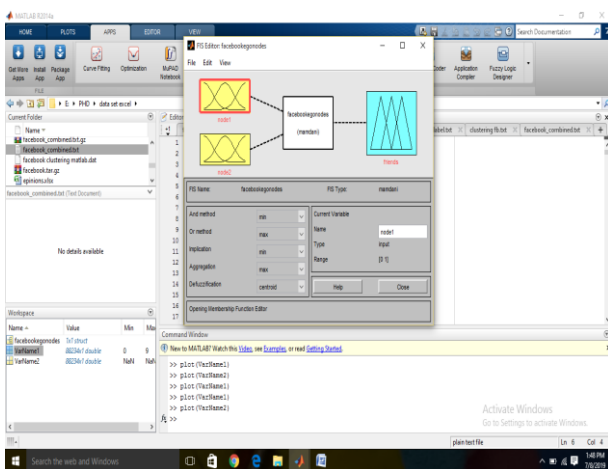


Fig 5: Fuzzy Editor

After testing , we examined the average testing error.

B. Fuzzy Rule

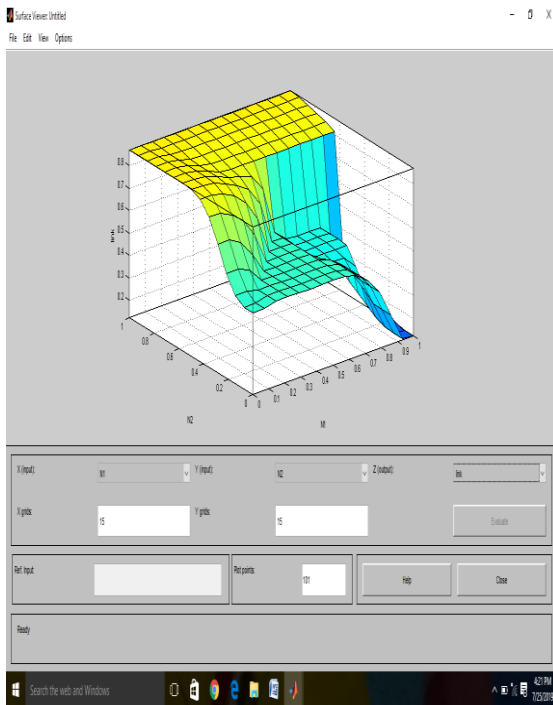


Fig 8: Surface Viewer

Surface View represents the mapping between two inputs and one output.

X axis (Input) contain N1, Y axis (Input) contains N2 and Z axis(output) show link between N1 and N2.

V. CONCLUSION

In this paper, we presented hybrid neuro/fuzzy approach. The purpose of this experiment and test results to analyze the suitability of ANN and Fuzzy sets method in a hybrid manner for social web sites classifications. First, we intend to use ANN methods in social media data classification in next we want to propagate the fuzzy approach. We calculated average testing Error, View Generation Rule, and Output Surface. We examined that Hybrid Optimization method takes less average testing error than back propagation method.

REFERENCES

1. Vishal Sharma et al, "Neuro-Fuzzy Based Horizontal Anomaly Detection In Online Social Networks", IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING, ACCEPTED ARTICLE, MARCH 2018.
2. Mohammad Malkawi et al, "Artificial neuro fuzzy logic system for detecting human emotions", Malkawi and Murad Human-centric Computing and Information Sciences 2013, 3:3
3. Aman Taneja, Mrs. Kamna Solanki, "Fuzzy Model for Review Classification Under Big Data System", International Journal of Computer & Mathematical Sciences, IJCMS ISSN 2347 – 8527, Volume 6, Issue 7, July 2017.
4. Upasana Sharma et al, "Link Prediction in Social Networks", A Neuro-Fuzzy Approach, Int. J. Advance Soft Comput. Appl. Vol. 8, No. 3, December 201, ISSN 2074-8523
5. Yixuan He† Kazuya Uesato† Hayato Yamana†, "Comparison of Community Detection Methods for Facebook Ego Network", DEIM Forum 2016 D2-5
6. A. Kloset, A. Niirnbegert, D. Nauck2, R. Kruse1, "Data Mining with Neuro-Fuzzy Models"
7. Detlef D. Nauck and Andreas N'urnberger, Neuro-fuzzy Systems: A Short Historical Review.

8. Mei Li *, Xiang Wang, Kai Gao and Shanshan Zhang, "A Survey on Information Diffusion in Online Social Networks: Models and Methods"
9. Miroslav Ćirića, Stojan Bogdanovićb, "Fuzzy social network analysis".
10. <https://www.computer.org/csdl/journal/lt/2012/03/lt2012030226/13rRUxNW21G>
11. Anu Sharma, MK Sharma, RK Dwivedi, "ANALYZING AND CLUSTERING FOR SOCIAL NETWORK using self organizing map", International Journal of Current Advanced Research, ISSN: O: 2319-6475, ISSN: P: 2319-6505,
12. <https://snap.stanford.edu/data/ego-Facebook.html>
13. <https://snap.stanford.edu/data/twitter7.html>
14. <https://in.mathworks.com/help/fuzzy/train-adaptive-neuro-fuzzy-inference-systems-gui.html>
15. https://shodhganga.inflibnet.ac.in/bitstream/10603/38948/10/10_chapter5.pdf
16. Padmaja Katta1, Nagaratna Parameshwar Hegde, " A Hybrid Adaptive Neuro-Fuzzy Interface and Support Vector Machine Based Sentiment Analysis on Political Twitter Data", International Journal of Intelligent Engineering and Systems, Vol.12, No.1, 2019
17. Farhat Roohi, "NEURO FUZZY APPROACH TO DATA CLUSTERING: A FRAMEWORK FOR ANALYSIS", European Scientific Journal March 2013 edition vol.9, No.9 ISSN: 1857 – 7881 (Print) e - ISSN 1857- 7431.

AUTHORS PROFILE



Ms. Anu Sharma, working as an Assistant professor in CCSIT, TMU, Moradabad, UP, India. She is pursuing Ph.D in CSE from Uttarakhand Technical University, Dehradaun. She has done M.Tech (CSE) from MMU, Mullana, Ambala. Her current research interest includes data Mining, Neural Network, Machine Learning. She is having experience of more than 12 years. She has published more than 11 research papers in International Journals.



Dr. M.K Sharma, working as a Professor in Amrapali Institute, Haldwani ,Uttarkhand, India. His current research interest includes data Mining, Neural Network, Machine Learning. He is having experience of more than 20 years.

He has published more than 35 research papers in international journals.



Dr. Rakesh Kr. Dwivedi, working as a Principal & Professor in CCSIT, TMU, Moradabad, UP, India. He has done his Ph.D from IIT Roorkee in Remote Sensing . He has done M.Tech (CSE) from UPTU , Lucknow ,UP. He has published more than 45 research papers in international/national conferences and more than 30 research papers in international journals. His current research interest includes Remote Sensing ,Digital Image Processing, Machine Learning, Deep Learning, Sensor Network.