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 media and technologies, SNS, which refers to Social Networking Services, have drawn more and more attention from users and researchers. 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 the 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 node clustering 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.
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.
a. Loading, Plotting, and Clearing the Data
b. Generating or Loading the Initial FIS Structure
c. Training the FIS
d. Validating the Trained FIS [14]
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                                    |
|               | Gauss2mf |        | 277.778                                         | 277.9519                                    |
|               | Gaussmf |        | 276.8809                                         | 277.9519                                    |
|               | psigmf  |        | 277.1611                                         | 2239.9298                                   |

After testing, we examined the average testing error.

B. Fuzzy Rule

Fig 5: Fuzzy Editor

Fig 6: Apply Fuzzy Rule

Fig 7: Rule 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.

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