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The Approach of Identifying Fake Identity by using Hybrid Ant Neuro-Fuzzy Clustering based Method

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ABSTRACT: With the advent of Internet the social media is growing in popularity and has become an integral part of the individual daily activities. Since all of us are so dependent on this social media that we cannot refrain ourselves even a couple of hours without social media and as result malicious users are increasing exponentially in social media with intent to gain access to the confidential information of the users. They used to create fake account and pretending to be others identity on the internet. So analysis of these fake users is an hour of need. In this paper we have proposed the new approach based on classification and clustering algorithms in order to identify the fake user. For this we have designed the new algorithm "Hybrid Ant Neuro-Fuzzy clustering based algorithm "which is based on Classifier to indemnify the purpose and used to find malicious user. We have tested this algorithm on various users – accounts and results got have been confirmed. This algorithm has fast classification accuracy and enhanced in many ways.

Keywords: Social Media Networks, Classification, Clustering, Ant Colony Optimization, Neuro-Fuzzy Approach, Fake Identity Profiles.

I. INTRODUCTION

Online social media is the platform where each individual wants to share, connect, collaborate and update their personal and professional linkages. The numbers of users of online social community is growing exponentially and it's an hour of need to remain updated on these platforms 24 × 7. The connect in the form of sharing their real time pictures and gathering likes and comments from various users is driving them crazy. The person with malicious intent creates fake identity profiles on social media and tries to collect their personal information which can be misused. With the advent of fake identity the personal information of various innocent users gets compromised. The social media sites are loaded with huge amount of information so the hackers fall prey to these kinds of websites. The basic motive is to capture the user's personal, professional, financial and real time activity tracking information and blackmailing them with various measures. Fake profile created on social media can be automated or humans like bots, cyborgs and trolls are known for spreading misleading information. This paper discusses the implementation of the hybrid based on ant colony and Neuro-Fuzzy logic and the observation therein. It may state the ant colony and Neuro-Fuzzy has been used for the purpose of optimization. The results are promising. This works paves the way of the use of ant colony and Neuro-Fuzzy to find the fake identity on the social media. The paper has been classified out as pursues: Section II is the literature review, Section III is the proposed model, Section IV is testing on live data, Section V is Results, and Section VI is Conclusion and Section VII Future scope.

II. LITERATURE REVIEW

An extensive Literature survey has been steered to discover the research techniques till now and find the research gaps in the current works. The new technique has been proposed based on existing work.

Now a days since the whole world was struggling the war against the COVID-19. But even then some of the wrong information has been circulated through these social websites. As we know everyone wants to know the actual news behind it. Everyone first choice is to know the right information about the COVID -19 topics. But some malicious user grabs the opportunity and makes the fake identity and spread wrong information. Cinelli *et al.,* provide the epidemic model that distinguish the information which was spread from any sources and found the wrong information that have been pass on the social websites. Also the author have provide the numerical which was not dependent on the any platform in order estimate the intensification of the rumours.

Christodoulides *et al.,* [2] has developed the new strategy that investigate the affect on the consumers that involved with brand ambassador products. Since it is challenge to study of those fake customers on the social web. Therefore the author has developed the new model that makes the connection between the handlers of user generated content and their association. The developed model has been tested online on around 202 social web consumers and the outcomes are very affective and gave the knowledge to handle the administrative initiatives to measure the user generated content for brand construction.

The results generated were very useful for avoiding problems and build the strong relationship between consumers and brands in the era of social web.

Since the account user on the social media are increasing day by day and also they hide their identity for nasty purpose. The author has developed the model using the machine learning concept in order identify the fake user account. The machine learning model was totally dependent on the feature called "friend to followers" for the detection of the fake user account.

In 2016 when there was the election for electing the US president many fake news was circulated through the social web. The broad survey has been taken Allcott and Gentzkow (2017) [3] and found that however social media is very important but leading resource of spreading the election news. From survey they came to know that only 14% Americans assume that social media was the major resource. The following data showed, who wants to favour the Trump and Clinton.

Social web	Number of times news circulated on social web
Facebook	30 million for Trump and 8 million for Clinton

The results are totally tremendous as the around half of the population just believe on the fake stories that was circulated on the social web.

Social networking websites like facebook, Twitter, Linkedin, Pinterest not only attract many people but also these websites are also useful for the enhancing the business. Out of these Face book is one of the most popular social website as the website also offer IPO which was the great in the field of Internet Technology. These websites are mainly used for marketing purpose, advertisements etc. But often these websites was misused by the diabolical users.

These users extract the most private information of the unconscious users. Krombholz *et al.,* (2012) the author established a complete data set for attacking on these websites and analysed connection between fakes user profile with the unaware user profile [4]. They have also created the focus group to analyse and made the complete set of counter measures to increase the awareness of the innocent user

Since the fake news that circulated on the social websites effect the all countries in all over the world. After the extensive survey by taking the around 1299 samples the author analysed that the country was inclined on the third user. Jang and Kim (2018) have developed the path model for identifying the past experience and the effect of the observations of the third person. The outcomes produced by the author was novel and showed how the third person inclination in the various ways of opposing the fake news [5].

Social networking websites gives the platform for the communication purpose. It is also used for sharing the information whether personal or professional. But some malicious user exploit and weak the social websites. So there is major challenge to detect the fake or malicious user that extracts the personal information and attack on the innocent user. Many research have been done for providing the protection to existing social web user but there is risk as of not having the profile of the user in the social websites. Conti *et al.,* (2012) investigate to alleviate the problem with the social sites. The author have also analysed through the graph in order to view the context of threats related with the private data [6].

Fire *et al*., 2012 was developed the method for the detection malicious by using the topological feature of the social websites. The proposed method was novel and can be applied to ant social websites [7]. The author has applied the developed algorithm on several sites and found to detect the various malicious users. The proposed method was valuable for the detecting the spammers, hackers and fake entities on the social sites.

III. PROPOSED APPROACH

The proposed Hybrid Ant Neuro-Fuzzy Clustering Based method is working on discrete an instance i.e. it identifies the element as exception if it lies in the cluster defined by the exception. The grouping based allocation which depends on the local cluster identified by the neighborhood has been used a local outlier factor in order to detect outliers. The numbers of density and object have been used in the proposed algorithm. The main advantages of using the clustering, and classification to detect the outliers is to analyze and find the most suitable approach for characterizing social media sites for fake identity detection and fraud user profile matching and using behavior study.

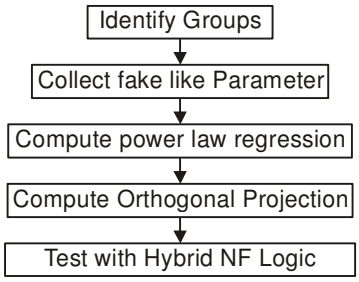


Fig. 1. Working methodology of Hybrid Ant Neuro-Fuzzy Clustering Based method.

The proposed model for fake identity detection is illustrated with the help of Fig. 1. The first step involves the collection of groups by clustering and classification approaches. Now the fake parameters are identified through which the profile can be analyzed as fake and authentic. After identifying the fake attributes a power regression model is applied whereby the absolute error among the entities is identified. Thereafter the orthogonal projection is applied to the curve which fits in a straight line on selected individuals. Fake identity can be identified if they fit in a small cluster and or they are deviated far from the curve through power law regression and orthogonal projection.

Algorithm of Hybrid Ant Neuro Fuzzy Clustering Based method

BEGIN

Input graph= (vertices, edges), max=iterations, c=number of clusters

Output=clusters, u= {u1, u2… un) where u is a subset of vertices

Step 1: initialize s= {V}

Step 2: For each node k belongs to graph G

Step 3: Identify egonet j ={v1,v2,v3 ,……,vn) belongs to v

Step 4: Create a new graph
Step 5: Obtain the coordinate of points (x,y) on the XY plane where the X and Y represent the graph matrix.
Step 6: Compute power law regression f(x)=axθ between graph metrics
Step 7: Find the minimum Euclidean distance
Step 8: Apply the result in MATLAB using the function FCM in M
Step 9: If x belongs to M
Step 10: u belongs to ui
END

Working Methodology of Algorithm:

The proposed algorithm identify the graph using user attributes and then by the power law regression model (e- = C/0), and applying orthogonal projection which states that "sum of two vectors that are respectively perpendicular to one another". The graph includes the number of attributes (N), the number of graph edges (E), the shortest path centrality ("betweenness") and a uniform cohesion between the individuals. The Relationship is analysed with the help of Artificial Neural Network of proposed algorithm.

After identifying the fake parameters by using ANN layer next level test will forwarded to Fuzzy layer metrics that include:

N: Total Count of messages in users profile in social media.

E:Number of relationship in users identity;

ABC: the shortest path centrality("betweenness") and a uniform cohesion between the individuals.

Com: the community cohesiveness output of ANN layer

The Hybrid Layer (ANN and Fuzzy) will apply the orthogonal projection of points, specifying the relations between the graph metrics on the power regression model, are calculated. The objective of the research is to remove the drawback of linear distance based model on which the fake profile of the individual are located far distance from the regression model. The assumption that the behavior of fake individual does not fit in the normal pattern. However, all exceptions are not considered as anomalies; sometimes the normal points in the graph are also located at a distance from the regression model and thus the points that are deviated with the normal representation of the curve with negative correlation cannot be considered as fake. Take an example, if the association between the attribute features is spread along the regression line and can divide and segment the line into different area, therefore, the distance matrix on the regression line would only be sufficient to indicate the fake profile alarms To overcome this difficulty of identifying normal from abnormal patterns orthogonal projection is applied to check negative correlation.

After this to check for abnormal behaviors any density based mechanism such as clustering can be applied on a set of characterized users.

For the proper working of the above algorithm we need the data that have taken from various social websites. The email ids of the different user need to be conserved. Therefore in order to conserve the space in the ids that was stored in regular expression. Two more algorithms which was based on Ant Colony Optimization and Fuzzy logic that reduces the text stored in regular expression.

The following algorithm classifies the characters in to different class i.e class for lower case, upper case, digits and other special notation.

Length preserving Algorithm1

```
Require : v.length>0
Procedure  convert(v)            'Aabc12'→'ullldd'
i ←--0
x ←"
while i < v.length do
if  isUpper(v[i]) then
x←x+'u'
else if  isLower(v[i]) then
t←t+'l'
else if  isDigit(s[i]) then
t←t+'d'
else
t←t+'o'
endif
endwhile
end procedure
```

The above proposed algorithm can reduce the length of the text.It can be verified for the emails. Now since name and number can be different in email id so it very difficult to detect the email id. This problem can be resolved by the next proposed algorithm that combine the similar class to form the single class. This algorithm is designed in such a way that it will not dependent on the characters specified inemail ids.

Algorithm 2

```
Procedure convert(v)             'Aabc12'→'uld'
i ←--0
v← (v)
beg ←"
x←-"
while i < v.length do
if beg!=v[i] then
x←x + v[i]
beg←v[i]
endif
i←i+1
endwhile
end procedure
```

The above algorithm is designed that use the distictive group of account that was created by single entiity. The algorithm has been tested on Matlab. The sample data has been taken with n=45 points in 3 dimensional space. Since there are two methods for solving this in Matlab by using command line and with graphical user. But we have used the first method i.e command line.

IV. EXPERIMENTS

Various Experiments has been conducted on matlab. For the proper working of the proposed algorithm the data set has been taken from the some social websites. Then we load the training data sets fuzex1trn. Data and Fuzex2trn. Data in to neuro fuzzy layer. These training data sets that have been loaded in neuro fuzzy train the structure by revise the connecting function. The outcomes have plotted by using circles in following fig

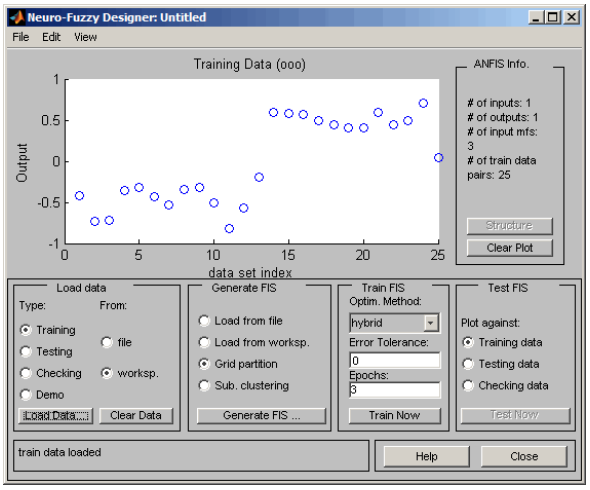


Fig. 2. MATLAB Experiment setup.

Once all the data have loaded in Neuro –fuzzy Layer next step is ANFIS training is to be done to begin the fuzzy inference engine. There are two ways through which the ANFIS is initializing the parameters.
With the generation of FIS
With the membership function for ANFIS
Once all the FIS data loaded the structure can be viewed as follows.

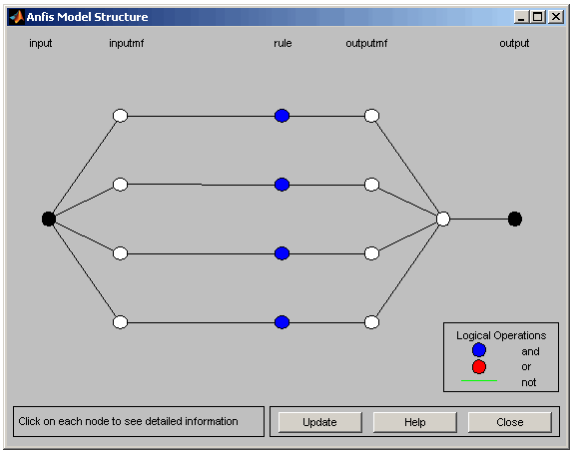


Fig. 3. ANFIS Model Structure Source: MATLAB Experiment setup.

In the above structure the branches specified in the graph is coloured. The colour indicates the use of the logical operators in the rule set. Left side specified input and the right side specified output. If we want to get information on any vertex we can get by clicking on any input and output vertex. And the structure function can also be viewed by clicking on the editor of structure function ot can also be done by the edit menu.
Now the next and most important task is to train the FIS model. For training Hybrid optimization techniques are available like back propagation, method of least square etc. This training can continued till to get the termination point. The termination point can be done by using the error tolerance i.e when the training data meet the error tolerance.

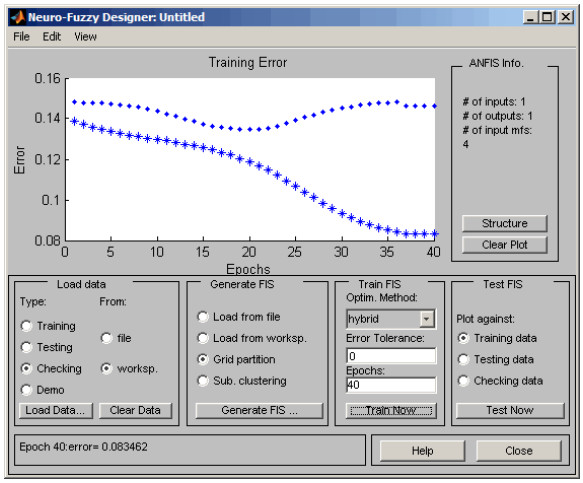


Fig. 4. Neuro-Fuzzy Designer Source: MATLAB Experiment setup.

The training error can be shown by the above fig. Where the *indicates the error. The slight increase in the checking error specifies the over fitting. But the target point of the training data of FIS is to select the minimum error. And last step for the training setup is to test the data set taken from the various social sites. The fig shown below is specified to click on the "test now" option.

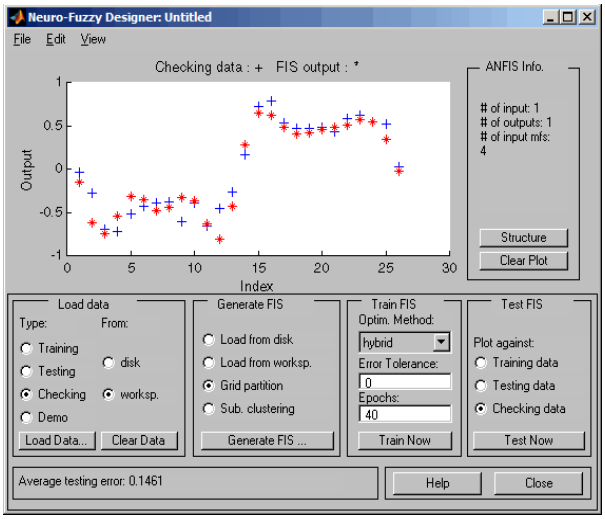


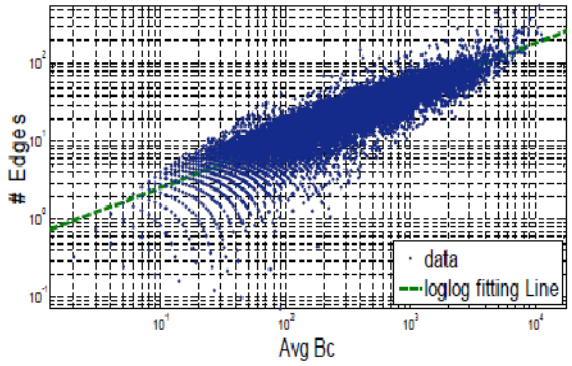
Fig. 5. Neuro-Fuzzy Designer Source: MATLAB Experiment setup.

V. RESULTS

We have used the fuzzy layer in test1 that deals with the deviation occur in order to detect the fake entities. This fuzzy logic algorithm is designed in such a way that it can handle multiple values at a time. The level of the deformity can be evaluated by structure function of lower and upper bound as specified above. This structure function identifies the label of each group. This fuzzy logic function can handle the significant features of the OSW (i.e. online social websites).

In test 2 the two layer that have implemented in matlab as specified combine ANN and fuzzy to test the proposed algorithm "Hybrid Ant Neuro-Fuzzy Clustering Based Algorithm". The orthogonal projection is applied to the results in test 1 which is depicted in Fig. 5.

Test 1:



Test 2:

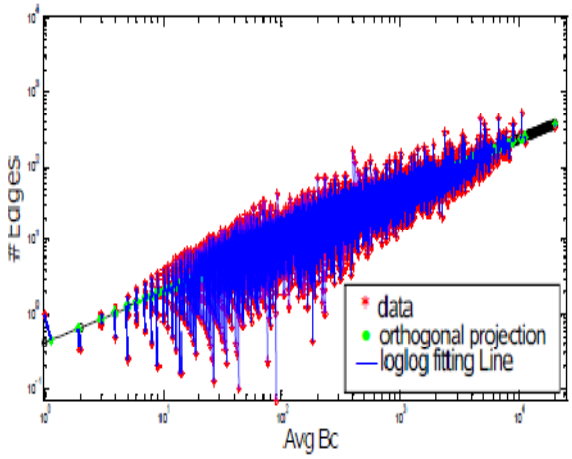


Fig. 6. Test 2 Source: MATLAB Experiment Reports tools.

Thereafter a fuzzy inference system (FIS) converts the user inputs (distinct inputs) taken from the data sets into linguistic variable (converts into natural words) using membership functions (MFs). Fuzzy logic converts the data into discrete set .The Inference Engine is designed on the basis of rules in the form of IF-THEN statements. By applying the concept of Fuzzy we get the results as relevant and irrelevant clusters.

Test results shown in Fig. 7 by this Hybrid Neuro-Fuzzy (HNF) may be utilised to identify fake attributes as Fuzzy set components that define the best fit model. As shown in Next Figure, with the two datasets used in this test, there is an increase in the user profile parameter of generated components with the increase in the number of attributes until it reaches six. As the number of parameters is increased there is less effect in the overall result. The merits of using this proposed model along with fuzzy logic can improve the accuracy and a distinction between normal and abnormal attributes. This unique approach of this type of implementation model is unsupervised and does not require the data for training.

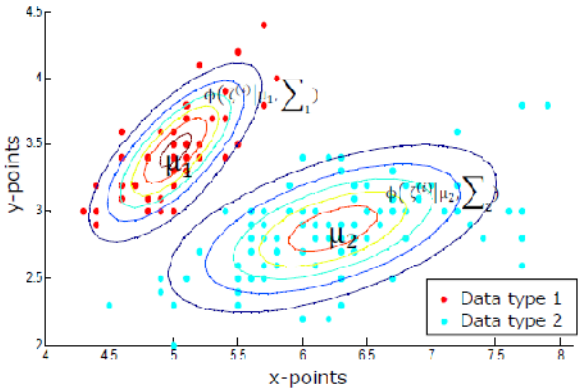


Fig. 7. Results shown by this Hybrid Neuro Fuzzy (HNF).

Comparison with other Algorithms: The efficiency of this algorithm is compared with the existing technologies on the basis of the parameters we have taken like Age, Profile, Follower Count, Name, Image, Status, Friends Count.

Algorithm	Accuracy to identification of fake entity
SVM	80%
Classification Algorithm	68%
Hybrid Ant Colony Algorithm	97%
Artificial Intellegence	87%
Genetic Algorithm	78%

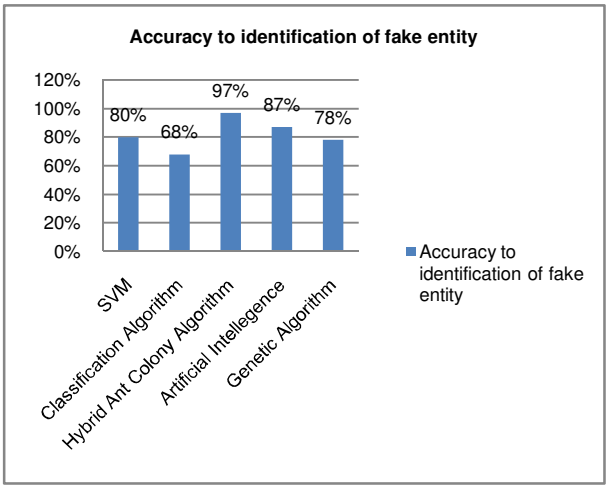


Fig. 8.

VI. CONCLUSION

The framework suggested above is implemented for investigating data profiles on social media. Our proposed algorithm achieved Area under Curve (AUC) 0.97 on a held-out test set and Area under Curve (AUC) 0.94 on out-of-sample testing data. The model has been tested on over 30,000 fake accounts using our proposed Hybrid Ant Neuro Fuzzy algorithm.

Our proposed algorithm extracted the profile at the time of registration. Especially, we don't require graph data or activity data. However, since the data available at the signup details is limited, the algorithm should be efficient in the sense that it should identify the fake v/s non fake users. The length preserving algorithm suggested in the above sections will compress the user profile into a small text which can be analysed for statistical measures.

At the time of registration the account level details has been clustered and it has been tested using random forest, logistic regression and support vector machine classifiers. The fuzzy layer was tested with 75:25 split tests. The tests conducted on Matlab using random forest gives the best approximation.

VI. FUTURE SCOPE

The proposed algorithm is tested on some social media sites. The future scope should be to identify the fake identity while creating the accounts in real time and must permanently block that IP and physical device of that user so that malicious activity from that source is permanently blocked.

Conflict of Interest. No conflicts of interest.

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