



” Recommendations in Social Network using Link Prediction Technique”

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Abstract- People’s lives have been impacted by the rapid growth of online social networks. The social network will evolve over time based on user interest. Predicting new and missing relationships. Link analysis can be used to determine the relationships between nodes in a social network. New linkages and nodes can be identified using this method. Information about the attributes is determined and for that machine learning techniques are employed as they offer a collection of features to improve performance through the use of monitored learning environment. The main purpose is to predict the probability of connection between nodes for personalized recommendations using supervised machine learning by training model, and the performance of the model is analyzed using prediction performance metrics.

Keywords: Social Network, Link Prediction, Machine learning, Performance metrics, Supervised learning, Twitch

Introduction-

A social network represents interaction and relationship among the people in a group or community. A relationship can be of any social relationship such as friendship, family, colleagues, business partner and purchase. The network can be visualized as a graph with nodes and edges. Where individuals are represented by nodes and edges represents the association between nodes. Association can be formed with mutual interests in a community. Social network changes very quickly over time with establishing new links and also break of old links. Relationship between the nodes will also change over time. So, predicting the missing relationship and future connecting links between node is a very important task in a social network.

Link Prediction in predicting links that either not yet exist at the given time or existing in each time t , but it is unknown at time $t+1$. Given a snapshot of a social network at some time t , predicting links that will be formed newly in the network between the interval from time t to a given future time $t+1$. By using features of node attributes in the network, future links can be identified. Link prediction also can be used for recommendation systems in a social network, information retrieval and in many other fields. Probability of finding link formed between nodes is very important as social network structure varies over time. For finding links in the social network there are different methods of link prediction. These methods help in finding many features set, which helps to increase accuracy.

I. LITERATURE SURVEY

1.PAPER NAME: -1. PAPER NAME: A WEB API RECOMMENDATION METHOD WITH COMPOSITION RELATIONSHIP BASED ON GCN

Author: Yangqi Zhang Changsha, China U.cn Li Kuang

Abstract: Mashup belongs to one of the most popular representations of software applications, which is generated by combining different kinds of APIs and data resources. APIs have developed rapidly, which accelerates the development of mashup. However, it brings the challenge of finding the right APIs for developers. Although there are many API recommendation approaches based on collaborative filtering (CF) techniques, they suffer the problem of data sparsity and the composition relationship between Web APIs in the mashup is not explored comprehensively by existing recommendation methods. To address the challenges, this study puts forward SVGAE (Semantic Variational Graph Auto-Encoder) based on the graph convolutional network, which is an end-to-end approach. Firstly, we utilize the API composition relationship in the mashup to construct the API graph. Next, side information of APIs is incorporated into the model, in which doc2vec is employed to process textual description of API and the sum pooling layer is used to extract multi-categorical features. We finally utilize a variational graph auto-encoder model as a link prediction task for API recommendation. The superiority of the proposed method has been proved by the experimental results.

2.Paper name: -Recommendations in Social Network using Link Prediction Technique.

Author: Ramya BV Dr. N Sandeep Varma R Indra

Abstract: Currently online social network with rapid development has become part of people’s life. Based on user



interest social network will change over time with different nodes and edges. Predicting new relation and missing relation between nodes in a social network can be identified using link prediction. Where new links and nodes can be identified with attribute information. Machine learning approaches are used with a set of features to increase the performance using supervised learning setup. Predicting the probability of connection between nodes for Twitch dataset, collected from SNAP and the main objective is to predict the probability of connection between nodes for personalized recommendations of game streamers using supervised machine learning by training model and performance of the model is evaluated using prediction performance metrics.

3.Paper name: - Link Prediction in Social Networks Using Bayesian Networks.

Author: Seyedeh Hamideh Shalforoushan , Mehrdad Jalali

Abstract: Link prediction is as an effective technique in social network analysis to find out the relations between users and has received great concentration by many researchers in recent studies. In this paper a method is proposed for friend recommendation in social networks using Bayesian networks. The Bayesian network is a reliable model to understand the relations between variables and has been used in many areas for prediction. This method with considering effective features on creating friendships, suggests friends to users accurately. First, the goal is to find attributes and similarities that have the most effect on creating a friendship. After that friend with most common similarities will be suggested to each other. The results of the proposed method are compared with those obtained from different algorithms like Friend of Friend and it is found that the method used in this paper significantly improves the accuracy of friend suggestion due to inclusion of several features

4.Paper name: -A Review of Link Prediction in Social Networks.

Author: Tingli Wang, Guoqiong Liao

Abstract: In recent years, with the emerging of social media, such as Facebook, Twitter, Sina Microblog, more and more researchers pay their attentions to social networks. Link prediction is one of the most interesting issues among the social network analysis, which exploits existing networks information, like the characteristics of the nodes and edges, to predict potential relationships to be formed in the future. This paper summarizes the link prediction methods in social networks, including tradition link prediction methods, link prediction methods in heterogeneous networks, and temporal link prediction methods.

II. PROBLEM STATEMENT

Recommendations in Social Network using Link Prediction Technique.

III. PROPOSED SYSTEM

1. System Architecture

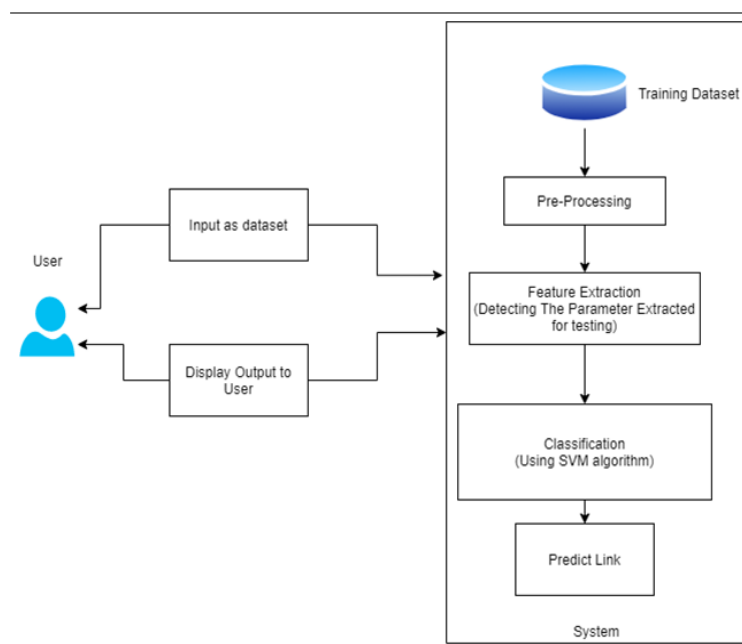


Fig: - System Architecture



2.Data Flow Diagram



Fig 2.1: DFD 0

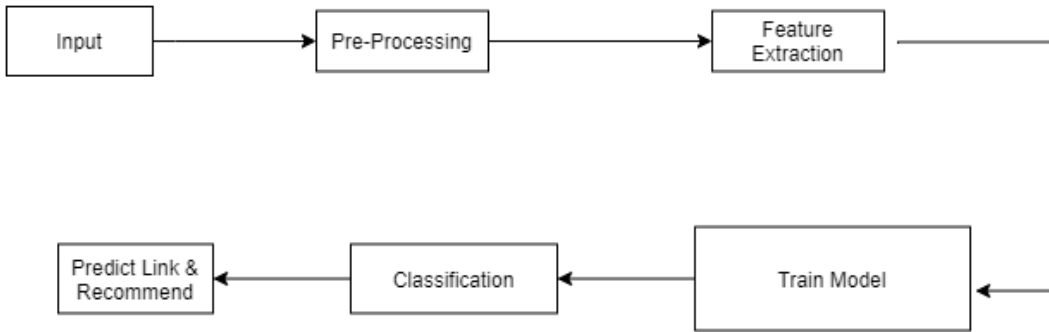


Fig 2.2: DFD 1

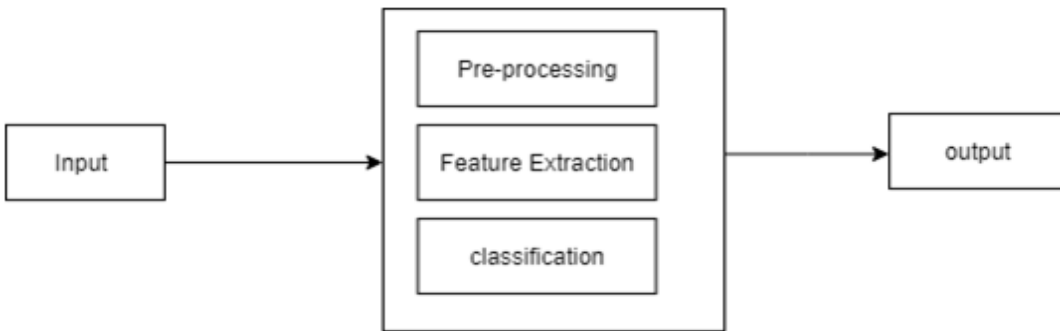


Fig 2.3: DFD 2

3.UML Diagram

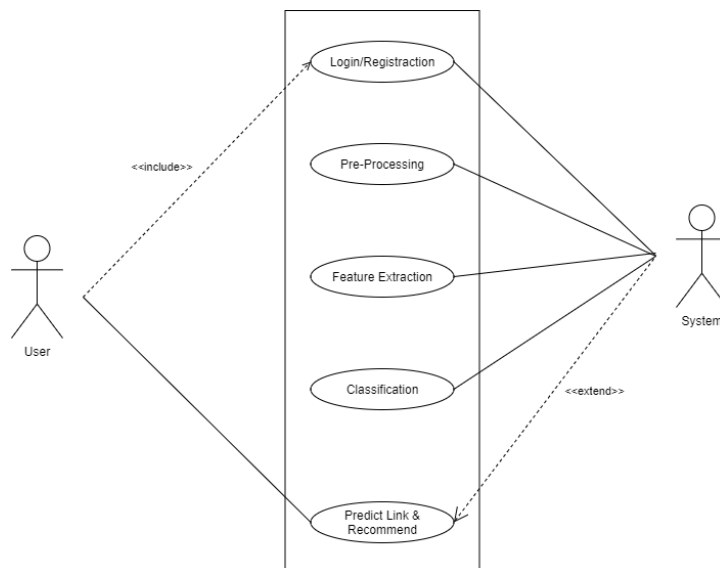


Fig 3.1:Use case

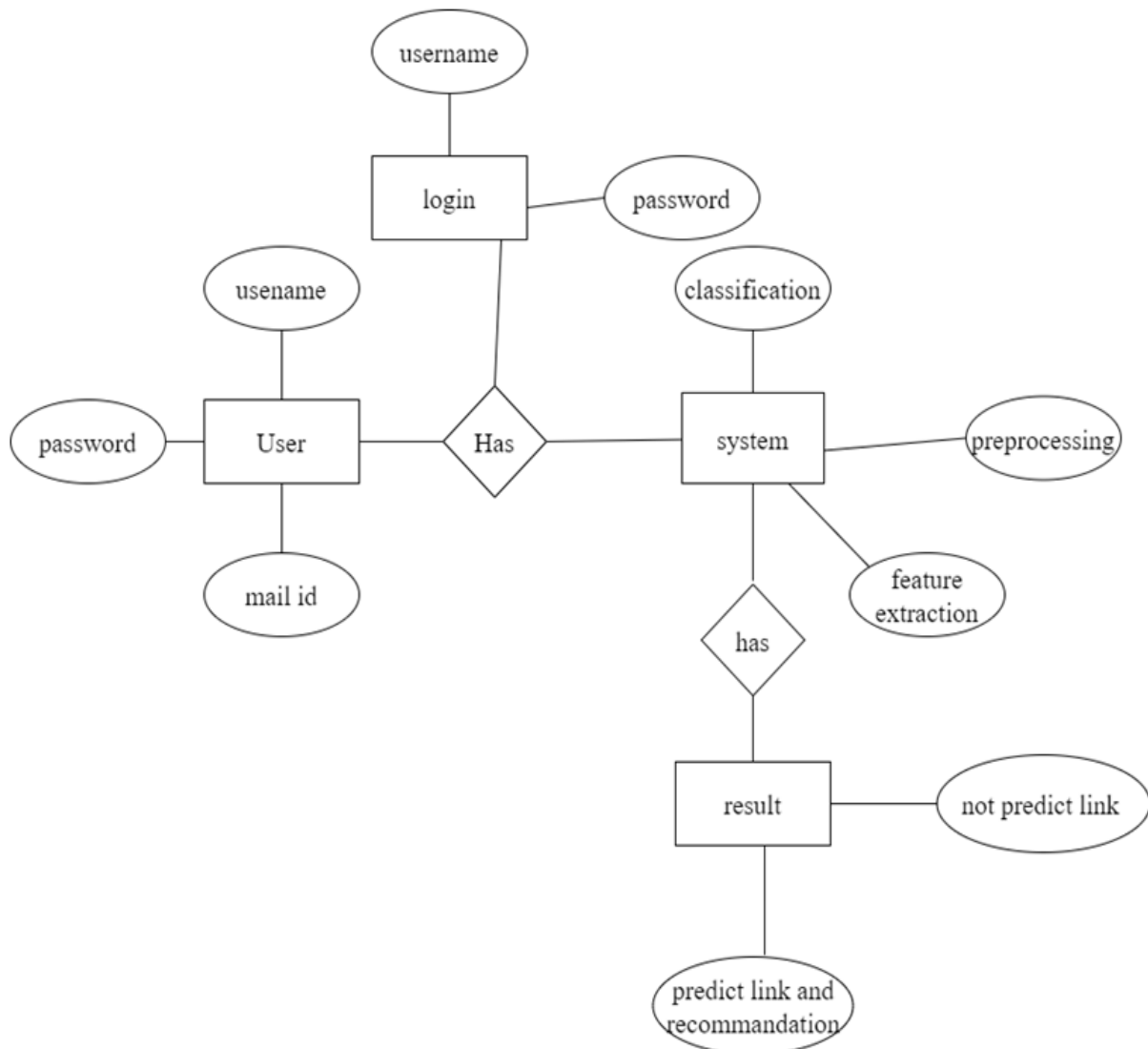


Figure 4.8: ER Diagram

Algorithm

Machine Learning Algorithm we used:

Support Vector Machine – Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane. SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine. Consider the below diagram in which there are two different categories that are classified using a decision boundary or hyperplane: SVM Method –

1. `from sklearn.svm import SVC`” Support vector classifier”
2. `classifier = SVC (kernel='linear', randomstate = 0)`
3. `classifier.fit (xtrain, ytrain)`

In the above code, we have used `kernel='linear'`, as here we are creating SVM for linearly separable data. However, we can change it for non-linear data. And then we fitted the classifier to the training dataset (`xtrain, ytrain`).

Difference in this project than the base paper:

Link prediction is one of the most interesting issues among the social network analysis, which exploits existing networks information, like the characteristics of the nodes and edges, to predict the potential links to be formed in the future. Link



prediction can be used for recommending commodities, discovering the missing links, and identifying the false links, etc. Therefore, link prediction is attracting more and more attentions of the experts in different fields. The exiting link prediction methods are mostly designed for static and homogeneous networks, that is, the types of nodes or edges are single. But these prediction models cannot be used for dynamic and heterogeneous networks, since they haven't considered the dynamic feature of the networks, Generally, the real social networks are complicated, and a network may have different types of nodes or links, which may have different contents or attributes

IV. EXPERIMENTAL RESULTS

Classification Report :		precision	recall	f1-score	support
	0	0.92	0.97	0.95	26489
	1	0.97	0.92	0.95	26497
	accuracy			0.95	52986
	macro avg	0.95	0.95	0.95	52986
	weighted avg	0.95	0.95	0.95	52986
Accuracy : 94.70803608500358					
Accuracy: 94.71%					

V. CONCLUSION

In this work different machine learning models are used for detecting the probability of link formation in future between nodes which helps to recommend different streamers. Many unsupervised link prediction features are implemented and suitable features are chosen using different method. In our system we used support vector machine (SVM) machine learning algorithm to achieve an accuracy of 94.7%.

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