

# Personality Traits based friend recommender system in social network

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## Abstract:

Friend Recommender System is an important part for any social networking site. These days' social networking sites gaining more popularity. Due to popularity, many Friends Recommender systems have been proposed. Most of the proposed systems are homophily based systems. Homophily is the proclivity to associate and bond with similar others. These systems recommend people based on common feature we share with them as friends. Friend recommender system based on homophily is accurate when common feature is physical or social. Physical or social features are like age, race, job, location, lifestyle etc. To recommend friends based on user personalities, personality traits-based friend recommender system in social network is proposed. The proposed method is different from homophily based friend recommender system, given personality typedoes not necessarily mean that you are compatible with users with same personality traits. Therefore, we present a friend recommender system based on personality traits, in which friend recommendation process based on personality traits. A personality based social network is designed to evaluate proposed method. The proposed method yields better results than collaborative filtering and other friend recommender systems like content-based friend recommendation system.

**Keywords:Friend Recommender system, Personality traits, Social Network, Collaborative filtering.**

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## 1. INTRODUCTION

Now a days, social networking sites become main mode of making friends, with more than 3 billion users around the globe [1]. These Social networks depends on friend recommendation systems that can be used detecting similarities between two people and connect them to each other. During past years many friend recommendation systems are proposed and most of them are homophily based systems, in which recommendation is based on common features which are physical or social features like age, gender, race, job, location and lifestyle etc. Homophily based systems will give accurate results when common features are physical or social. There is a different approach when you consider personality types. All most all researchers say that no similarity in personality between friends [2], [3]. Many surveys suggested that there is a similarity between friends and couples in personality [4]. Major challenges in friend recommendation system are cold-start problem. The missing information is very crucial in recommendation process. Cold start problem can be overcome by personality information [5].

In our work, we present and evaluate friend recommendation system based on personality traits model and k-means clustering, in which recommendation process is based on personality traits. The proposed method is validated by designing a personality trait based social network named FRSNet. Prediction accuracy is enhanced in proposed friend recommender system and cold start problem also reduced. Our contribution is summarized as follows.

- 1) Propose a personality-based FRS (Friend Recommendation system) in social network based on personality traits and k-means clustering.
- 2) Social network site is designed for proposed friend recommendation system
- 3) Online experiment is conducted to validate proposed friend recommender system.

## II. RELATED WORK

### A. Friend Recommendation Systems

“Wang et al. [12] proposed the Friendbook, an FRS that is based on semantic technologies. Friendbook recommends friends to users based on their lifestyles rather than social graphs. Friendbook identify users’ lifestyles from user smartphone sensor data, after detecting their lifestyles, it recommends friends that have similar lifestyles.”

“Yu et al. [13] presented GeoFriends, an FRS that recommends geographically related friends by social network structures analysis through combining GPS information.”

“Silva et al. [14] developed algorithm that analyses the subgraph formed by a user and all the others connected users separately by three degrees of separation. Nevertheless, only users separated by two degrees of separation are candidates to be suggested as a friend. Hamid et al. [15] proposed a friend-recommendation system based on cohesion.

They analysed the cohesive subgroup on an augmented network formed by the physical connection network with the information of common interests and interactions. Bian and Holtzman [16] and Bian et al. [17] designed and implemented Matchmaker, a CF system that recommends friends to users on Facebook by matching and comparing user’s online profile with the profiles of TV characters. For example, if Facebook user X is like TV character 1, and Facebook user Y is like TV character 2, and character 1 and character 2 are friends in the same TV show, then the Matchmaker system recommends user X to become friends with user Y.”

None of the systems have not used personality traits in Friend recommender systems (FRS).

Many research works discussed the application of human personality in computing systems. Some preliminaries of personality traits and recommender systems are presented below.

### B. Human Personality

There is no general theory to define human personality. So many theories are presented the concept of human personality in different perspectives over the time. There are different perspectives of human personality like biological perspective, cognitive perspective, learning perspective, humanistic perspective, psychodynamic perspective, and trait perspective [6]. The most used personality theory is trait theory which is called as dispositional theory. Personality trait theory suggests that human personality can be identified by the measurement of personality traits. Personality traits are defined as habitual patterns of behavior, thought and emotions [7]. Personality traits influence human behavior. Personality traits are stable over time, differ across individuals. Personality traits are consistent over time. To measure personality traits in trait theory, mainly there are two popular methods. First one, Eysenck Personality Questionnaire-EPQ, which is also called as three factor model. Second one, big-Five personality traits which is also called as Five-Factor model-FFM. Five factor Model is widely used for various purposes like job recruitment, mental disorder diagnosis etc. In Five- Factor Model, five factors are defined as Openness to experiences, conscientiousness, extraversion, agreeableness, and neuroticism.

The five factors and associated characters are presented below.

Openness to Experience	to	Artistics, Curious, Imaginative, Insightful, Original, Wide Interests
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Agreeableness	Trusting, Generous, Appreciative, Kind, Sympathy, Forgiving
Conscientiousness	Efficient, Organized, Planful, Reliable, Responsible, Thorough
Extraversion	Energetic, Outgoing, Active, Assertive, Talkative
Neuroticism	Anxious, Unstable, Tense, Touchy, Worrying, Self-Pitying



Fig 1: Five Big Personality traits

Source : Wikipedia

### C. Recommendation System

A recommendation system is a filtering system which filters information that is used to match a subject (user) with the best item (friend or product) based on the preferences. Friend recommendation system is a special case of recommender system in which items are set of users/friends.

Mainly there are three recommendation approaches:

#### 1) Content based Filtering

Content based filtering recommends items to the user that are like items which are liked/viewed/bought previously or examining the present. Content based recommender system [8],[9] can be used in wide variety of domains ranging from recommending news articles, hotels, movies, items for sale. Content based recommender is accurate in recommending items when items is well described [10]. The profiles of other users do not influence the recommendations of the target user [10].

## 2) Collaborative Filtering

Collaborative filtering is depending on the theory that people who agreed previously, they may agree in the future also, and that they may like/buy/views same items as they have liked/bought/viewed the similar items in the past.

## 3) Hybrid filtering

Hybrid filtering is the combination of Collaborative filtering and content-based filtering.

### III. PROPOSED METHODOLOGY

We presented a personality traits-based friend recommender system based on k-means clustering and hybrid filtering.

#### A. System Construction

In the first module, we construct Friend Recommendation System construction module for the implementation of our proposed model. In this module we design to have widely used to provide users with high-quality personalized recommendations from a large volume of choices. After registering the network, the user has to answer questionnaires provided. In this state, the user does not have any preferences. This is called cold start problem. This problem can be handled by initial recommendation based on similarities between user and his/her neighbours (users have same personality traits).

#### B. Similarity Measure

The main component of any recommendation system is similarity measure. This similarity measure is used to measure the similarity between two entities (users and items) based on similarity factor. Examples of similarity factors are browsing history, product ratings and product category. In recommendation systems a very precise similarity measurement leads the system to predict the future behaviours of the target entity based on the behaviour of neighbours (similar entities). In our method, we first measure the similarities between two users based on their personality traits (Similarity measure/factor).

#### C. Hybrid Filtering

Hybrid recommendation systems are designed by combining multiple recommendation techniques together to produce good output. When we compare hybrid recommendation system with collaborative and content-based systems, the recommendation accuracy is higher in hybrid systems. There is a lack of information about the domain dependencies in collaborative filtering and people preferences in content-based systems. This is the reason to have lower accuracy in collaborative and content-based systems compared to hybrid systems. The combination of these two will lead to common knowledge increase, which gives better recommendations. By combining techniques, the knowledge increase makes it especially ensure to drive new ways to extend underlying collaborative filtering algorithms with content data and content based algorithms with the user behaviour data.

#### D. K-Means Clustering Algorithm

The K-Means clustering algorithm was proposed by MacQueen. K-means. Clustering algorithm divides the objects into meaningful groups based on similarity. Clustering is unsupervised learning technique in Machine Learning.

- a) In K-means clustering technique, we choose K initial centroids, where K is the desired number of clusters.

- b) After that, each point is assigned to the cluster with nearest mean (i.e. the centroid of the cluster).
- c) Then we update the centroid of each cluster based on the points that are assigned to the cluster. We repeat the process until there is no change in the cluster centre (centroid).
- d) Finally, this algorithm aims at minimizing an objective function, in this case a squared error function.
- e) The objective function where, k is the number of clusters, n is the number of cases is a chosen distance measure between a data point and the cluster centre is an indicator of the distance of the n data points from their respective cluster centres.

E. Flask- A web Framework

Flask is a web framework used to build web application. Flask provides tools and libraries to build web applications. These web applications can be web pages, blogs, websites, etc. It is an API of python. It is easier to build web applications with Flask, because of less code.

IV. EXPERIMENTAL RESULTS

Data:

To validate proposed personality traits based friend recommender system, International Personality Item Pool (IPIP) - Five Factor Model (FFM) is used. IPIP –FFM dataset contains 1015341 rows and 110 columns of data of different users of different personality traits.

Results

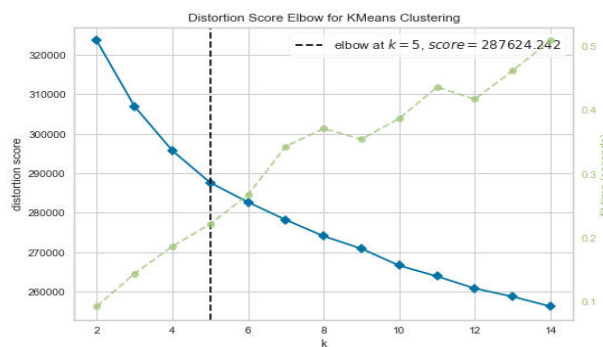


Fig 2: Distortion Score Elbow for K-means clustering.

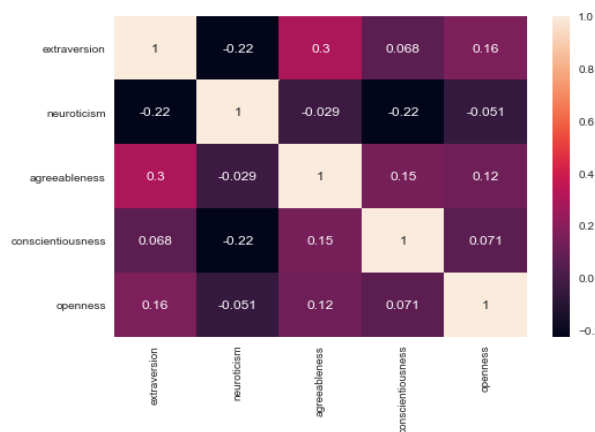


Fig 3: summary statistics of the total scores

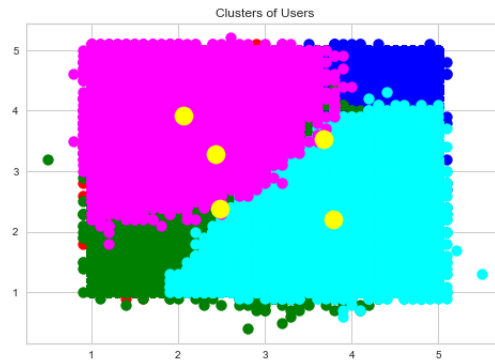


Fig 4: Clusters of users

Fig 5: Personality traits based FRS social network.

## V. CONCLUSION

In this paper, a new Friend recommender system which can be used in the social network is developed based on personality traits is presented and evaluated. In this friend recommendation system, the implementation is on personality traits and user interests. To validate proposed system, a web application is designed and evaluated. By conducting experiments, we state that our method performs better than collaborative filtering-based recommender systems.

The proposed model can be enhanced by incorporating other good personality traits models like Myers – Briggs type indicator.

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