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PersoNet: Friend Recommendation System Based on Big-five Personality Traits and Hybrid Filtering

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Abstract:

Friend recommendation system is a fundamental part of any social network system. With the craze of social network sites, many FRS have been proposed in the past few years. In other words, these systems will delegate people that you share common features with them as friends. Homely based FRS is an exact when the common feature is a physical or social feature, such as age, race, location, job, or lifestyle. But it is not the case with personality types. Having a given personality type does not automatically mean that you are agreement with people that have the same personality type. Therefore, in this paper, I present and calculate an FRS based on some personality character model and hybrid filtering, in which the friend recommended action is based on personality character and users' harmony rating. To justify the proposed system's efficiency, a personality-based social network site that uses the proposed FRS named PersoNet is implemented. Users' rating results show that PersoNet achieve collaborative filtering (CF)-based FRS. This paper also shows sentiment analysis types and techniques used to perform extraction of sentiment from reviews, for this we have taken sentiwordnet dataset and applied Sentiment Analysis algorithm for opinion mining. In this project, we have taken comparative study of techniques and approaches of sentiment analysis having ecommerce reviews as a data.

Index Terms: - Friend recommendation system (FRS), hybrid filtering, personality computing, collaborative filtering, sentiment analysis.

INTRODUCTION:

With more than 3 billion active users around the globe [1], social networking sites (SNSs) have become the main approach of formulation new friends. It had been proven that friendship in SNS can better case self-report friendship compared to friendship created by frequent physical detect [2]. Each

one of these social networks on a friend recommendation system that is used to detect common features between two people and, therefore, connect them to each other. Many FRS have been proposed in the past few years, but most of them are based on homophily (the propensity of people to associate and bond with similar others). In other words, these systems will recommend people that have a common feature with you as friends. Homophily based FRS is adequate when the common feature is a physical or social feature, such as age, race, location, job, or lifestyle. However, when it comes to personality types, things are different. Personality-based FRS brings up a very old psychological debate about the personality similarities between friends. During most of the main stream researchers disagree that there is no similarity in personality between friends [3], [4]. Recent researchers have advised that friends and couples indeed are similar in their personality [5]. In addition to that, a primary challenge for FRS is known as the cold-start problem, where the recommendation system does not have sufficient information about the new user, and the missing information is urgent in the recommendation process. In this case, personality information can help to ease the cold-start problem. For the above-mention logic, in this paper, I present and check an FRS based on the big-five personality character image and combination filtering, in which the friend recommendation process is based on personality character and users' harmony rating. To certify the proposed system's accuracy, a personality-based social network site that uses the proposed FRS named PersoNet is implemented. The proposed system not only enhances the prediction accuracy of recommendation systems but also alleviates the cold-start problem of the legacy collaborative filtering (CF) systems. To compare PersoNet with the legacy FRSs, we have implemented three recommendation systems and compared them based on their precision and recall values: 1) FRS based only on personality matching; 2) FRS based only on CF; and3) the proposed system PersoNet, which is based on personality traits and hybrid filtering. Users' rating results show that PersoNet performs better than the other two FRS in terms of precision and recall.

A. Human Personality

There is no general theory that defines the human personality. Nevertheless, many theories have elaborated the concept of human personality from different perspectives, including the cognitive perspective, biological perspective, learning perspective, humanistic perspective, psychodynamic perspective, and trait perspective [6].

Trait theory (also known as dispositional theory) is the most adapted personality theory. The trait theory suggests that human personality can be identified by the measurement of personality traits. Trait theorists define personality traits as habitual patterns of behaviors, thoughts, and emotions [7]. Personality traits are relatively stable over time, differ across individuals, relatively consistent over situations, and they influence human behaviors. There are two major methods used in trait theory to measure personality traits, Eysenck Personality Questionnaire (EPQ) also known as the three-

factor model and big-five personality traits also known as the five-factor model (FFM).

The big-five traits are based on common language description of personality, which make trait theory an ideal model for computing technologies, such as natural language processing, machine learning, and semantic technologies. FFM is widely used for various purposes, such as job recruitment or mental disorders diagnosis. The model defines the five factors as openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism, often represented by the acronyms OCEAN or CANOE, in Table I, the five factors along some of the associated characters are presented.

There are many methods to measure one's personality; questionnaires where subjects answer with Likert scale questions about how they describe themselves are the most common personality measurement method. There are many well-known personality questionnaires with different lengths (items count). NEO Personality Inventory-Revised (NEO-PI-R, 240 items) [8] is one of the most adopted long personality questionnaires. For medium-size questionnaires, the NEO five factor inventory (NEO-FFI, 60 items) [8], and the big-five inventory (BFI, 44 items) [9] is used frequently. Some other short questionnaires are much faster to fill (5–10 items), such as BFI-10 [10], short questionnaires retain only the most correlated items with each personality traits.

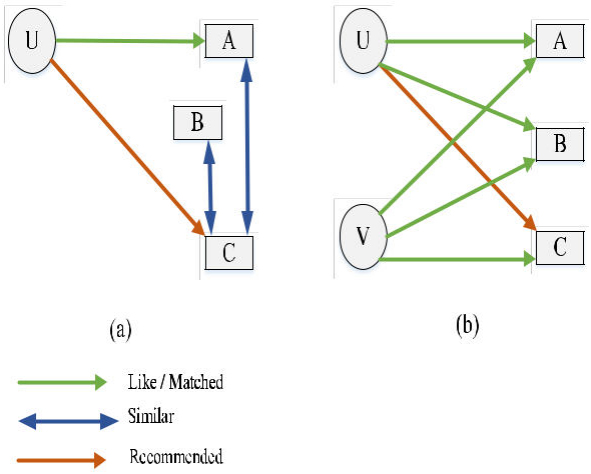

Fig.1 (a) Content filtering. (b)CF.

B. Recommendation Systems

A recommendation system is an information filtering system that is used to match a subject (e.g., user) with the best items (e.g., product and friend) that is suitable for its "demand" and/or "option." FRS is a special case of recommendation system where the element are a set of users. There are three main recommendation approaches as follows.

1) Content filtering [Fig. 1(a)] recommends element that are similar to those that a user (liked/bought/viewed) in the past (or is examining in the present). specially, various applicant items are compared with items previously (liked/bought/viewed) by the user and the best-matching elements are recommended.

2) CF [11] [Fig. 1(b)] is based on the hypothesis that people who agreed in the past will agree in the future, and that they will (like/buy/view) be the same (or similar) items as they have (liked/bought/viewed) the same (or similar) items in the past.

3) Hybrid filtering is a combination of content filtering and CF.

4) In the literature of social networks, many FRSs have been proposed, Wang et al. [12] proposed the Friend book, an FRS that is based on semantic technologies, Friend book recommends friends to users based on their lifestyles rather than social graphs. Friend book identify users' lifestyles from user smartphone sensor data, after detecting their lifestyles, it recommends friends that have similar lifestyles. On the other hand, Yu et al.

Symbol	Meaning
$U=\{u_1, u_2, \ldots, u_n\}$	The set of all the users
$SimP(u_x, u_y)$	Similarity between u_x and u_y base their personality traits
$r_{x,y}$	Harmonic rating given by u_x to u_y
$R_x=\{r_{x,1}, r_{x,2}, \ldots, r_{x,}$	The set of all harmonic rating give u_x
$SimR(u_x, u_y)$	Similarity between u_x and u_y base their given harmonic rating
$SimM(u_x, u_y)$	Similarity between u_x and u_y base their average daily exchanged messa
α	The weight parameter that control contribution of personality-based sim ity in the overall similarity measure neighbor formation procedure
β	The minimum rating similarity thres

SYSTEM MODEL

The system design of the proposed system is presented in Fig. 2. After joining the network, the user must answer a personality measurement questionnaire. As the user has no preferences at this moment (cold start), to overcome this situation, the initial recommendation is based on personality similarity between the user and his neighbors (users with similar personality traits). In other words, the system recommends users that have identified as harmonic friends with neighbors of the new user. When the user passes the cold-start period, the recommendation will be gradually enhanced by incorporating the user's harmony rating preferences. As shown in Fig. 3, at the second stage, the recommendation is based on personality similarity and hybrid filtering approach (CF in terms of rating similarity with neighbors, and content filtering in terms of personality trait similarity between the previously rate friends and the potential friends).

A. Notations

For the sake of readability, the list of notations used in this paper is explained in Table II.

B. Similarity Measure

Similarity measure is the main component of any recommendation system and is used to measure the similarity between two entities (e.g., users and items) based on FRS.

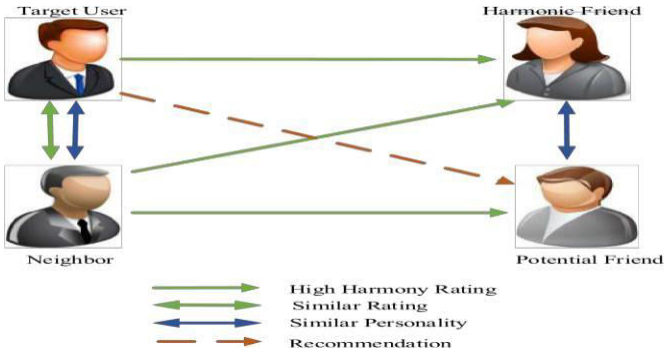

Fig. 2.Personality traits and hybrid filtering-based recommendations.

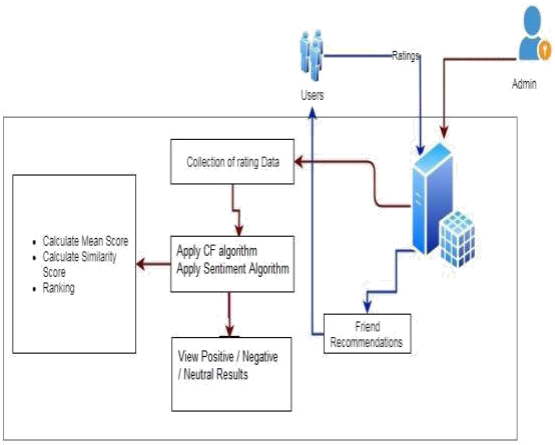

Fig. 3 **System architecture**

COLLABORATIVE FILTERING: User-based nearest-neighbor collaborative filtering

- A common prediction functions.
- Calculate whether the neighbor's ratings for the unseen item I are higher or lower than their average.
- Combine the rating differences use the similarity with 'a' as a weight.
- Add/subtract the neighbors' bias from the active user's average and use this as a prediction.

Sentiment Embeddings with Applications to Sentiment Analysis:

- In this paper, propose learning sentiment-specific word embeddings dubbed sentiment embeddings for sentiment analysis.
- We retain the effectiveness of word contexts (n-grams) and exploit sentiment of texts (Word Elaboration) for learning more powerful continuous word representations.
- Sentiment calculation (Positive and Negative) we done using **Sentiword dataset** http://sentiwordnet.isti.cnr.it.

Implementation

To justify the proposed system's efficiency, a personality based SNS that uses the proposed FRS named PersoNet was implemented, in which the online experiment was conducted to study users' satisfaction about the site's recommendation system. PersoNet was implemented using PHP, and the database management using MySQL, and the front-end interface using the bootstrap framework.

Fig. 4 PersoNet Friend Recommendation social network

Result Discussion:

The mean values of precision, recall, and F-measure of the three systems are presented in Fig. 5. As we can see, FRS has the worst performance in terms of positive (3) and negative (1), as it considers only personality trait similarity measurement and ignores the users.

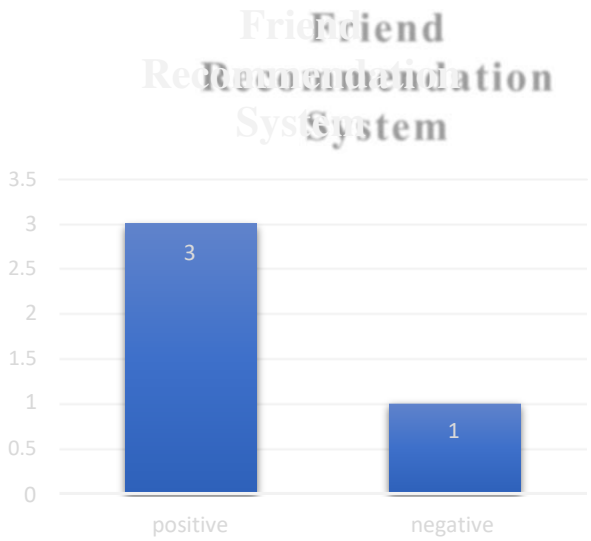

Fig. 5 Systems evaluation with rating & review -based similarity.

previous harmony ratings, while CF scores are much better than positive (3) and negative (1). However, PersoNet has the highest positive and negative values among the three systems, with positive (4), negative (3), neutron (4) that is, because it incorporates personality traits in similarity measurement without neglecting the user's preferences.

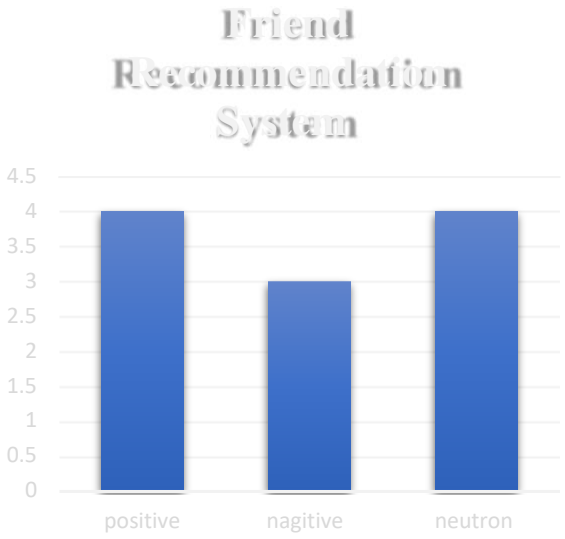

Fig. 6 Systems evaluation with review-exchange-based similarity.

Proposed System

[1] In my system using Collaborative filtering (CF) is a technique used for recommender systems.

[2] In this paper, propose learning sentiment-specific word embeddings dubbed sentiment embeddings for sentiment analysis.

[3] The personality traits similarity between the user and his neighbors.

[4] The personality traits similarity between the potential friend and the previously rated users (content filtering).

[5] The rating similarity between the user and his neighbors (CF).

CONCLUSIONS

In this paper, a novel FRS based on the big-five personality character model and combination filtering was presented and assess, in which the friend recommended process is based on personality charcter and users' harmony rating. To justify the proposed system's efficiency, a personality-based social network site that uses the proposed system named PersoNet was implemented. The preliminary results have proved that PersoNet performs better than the tradition CF-based system in terms of precision and recall. However, many aspects that could improve the effectiveness of Personet have not been discussed in this paper, such as follows.

1) In this paper, the subjects' personality traits measurement was done through questionnaires. However, PersoNet could be

further improved by implementing automatic personality recognition scheme, which measures the user's personality traits based on its posted content, without the need for personality test.

2) The effectiveness of PersoNet was evaluated based on the recommendations accuracy that was validated by the users' rating. Extending the experiment by comparing PersoNet's recommendation accuracy to other schemes, such as graph-based and semantic-based recommendations, is our future direction.

3) The proposed recommendation system is based on the big-five personality traits model. Extending the model to incorporate other personality traits models such as Myers–Briggs type indicator is one of the future works. 4) The population of the experiment is relatively small (n = 126). Conducting the experiment on a large size population (n > 1000) from all ages is a future direction.

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