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Recommendation System Comparative Analysis: Internet of Things aided Networks

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Abstract

Today, the public is not willing to spend much time identifying their personal needs. Therefore, it needs a system that automatically recommends customized items to customers. The Recommender system has an internet of things (IoT) that entails a subclass of evidenced-based sieving structures that pursues to forecast the assessment of a customer would stretch to an item. Within social networks, numerous categories of RS operate on different recommendation expertise. In this state-of-the-art, we describe and classify current studies from three different aspects by describing different methods of recommender systems. The Friend Recommendation System in social networks is necessary and inevitable, and it is due to this kind of coordination that inevitably recommends latent friends to customers. Making recommendations for friends is an imperative assignment for community networks, as obligating supplementary networks customarily superiors to enhanced customer experience.

Keywords: Companion Recommendations, Privacy, Security, Social Networks Systems

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1. Introduction

The public today is noticed to be busy with their works in the fast-moving world and operating within the shortage period possible in identifying your needs for individual info. Subsequently, a system that automatically recommends info to the public is in higher demand and need [1-9]. Nowadays, social networking sites are becoming very popular due to the communication aspect of the world. The public can connect using these sites; they can also share the information. Social networking is where the public can connect with the other public away with them, the only and easy strategy for communicating with the public around the world with the aid of social networking services [10-19].

Recommender systems have made significant use of daily life in the routing. Connection with social networking sites and Companions is a very important part of life. It may be useful for business intelligence, creativity, or new team building. Social media publicizing platforms for example Telegram, Twitter, Sina-Weibo among others draw more attention since many connections have been established without any previous knowledge. The establishment of user relationships is a key feature of a social network. It is, therefore, necessary for researchers to look for a new way of giving more importance to recommendations [20-25].

Recently, Companion Recommendation (CR) in operational community nets necessities undergoing a speedy advancement and plays a substantial role. CR is an essential feature in social systems as well as real-world requests and is informed by customer preferences such as experiences, safety, and accomplishments. A significant challenge in the program is how to recommend good confidantes. Existing social networking services advise users of Companions based on their social graphs [26-29].

Social media platforms and their associated benefits to the customers (users), for example, case in point YouTube, Facebook, and Instagram, among others recommend confidantes per the content shared and social relationships with their common confidantes.

Furthermore, Amazon's recommendation system uses the item to the colle
items to the user

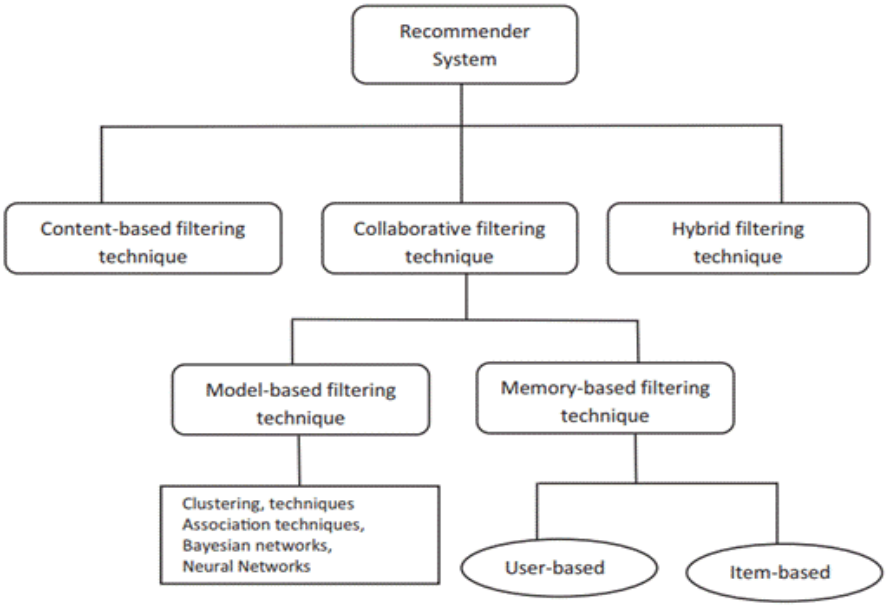

Figure 1. Recommender systems methods flow chart

We have outlined the types of methods available in Companion recommendation systems in the following sections. Some recommendation systems, such as personality-based recommendation systems, suggest Companions based on users ' personalities where the scheme tests the match amongst users' traits.

The delinquency associated with this nature of RS as demonstrated in Figure 1, is that customers are concerned approximately in what way their private info (private data) is rummage-sale and most importantly how the protection of their personal information or private data is handled. The two identified factors tend to decrease the quantity of info provided by the customers and correspondingly where there is no proof for the information given to a user because individual data is factual or fabricated. Altogether, these problems affect the perfect system recommendation.

This paper principally presents the state-of-the-art is to classify and categorize the types of recommender systems for Companion recommendation based on the research literature, discovering a generic template for Companion recommendation that is used in most state-of-the-arts, to analyze the different social networks and examine the nature and features of each. Finally, we categorize different social media connectivity per the research literature.

The paper is structured as follows. Secondly, the next section presents and explains the categories of Recommender System methods. Within the third section, we avail of a detailed comprehensive summary review of the study. The fourth section presents a comparative study. Section 5 illustrates the Evaluation dataset. The next section conclusively holds the concluding remarks and forthcoming activities are included and stressed.

2. Recommender Systems Methods

In this section, we describe a variety of methods in recommender systems discussed below.

2.1. Location-Based Filtering

One of the key social technologies in urban space is the location-based recommendation framework. The location-based recommendation is an information filtering service that delivers things such as destinations, travel routes, contacts, or social media to a user selectively, considering contextual spatial information such as current or historical locations and private preferences [31].

2.2. Satisfied-Establish Filtering

A standard satisfied-based RS exists at the data source based on user needs and information. It compares and extracts web pages and data sources information and matches user preferences. It too uses measures of prominence and regular uses to identify the material that is most used and most challenging. This definition is used to evaluate and arrange material according to demand and popularity.

In general, the definition associated with objects or current content is identified and contrasted with user preferences. Several techniques for document modeling, knowledge retrieval, and techniques deriving information from the content of pages are proposed in many Web-

based customized applications such as e-commerce and e-learning sites. User profiles are generally described as vectors in such applications so that each vector entry represents a weight or a degree of interest for each item on the Web pages [32].

2.3. Collaborative-based filtering

The collaborative or so-called social-based approach is an alternative approach to previous approaches, aimed at improving the shortcomings of content-based approaches. It exploits the profiles of the other user within the same community and suggests new objects (entities) that the customer did not previously proportion or comprehended per the hypothesis that alike consumers have alike interests in each community. Recommendations, therefore, take place based on user similarities and recommend things from the same community's fascinating list of other users [33].

2.4. Knowledge-based filtering

Knowledge systems propose recommendations or approaches by manually or automatically producing a set of assumptions and guidelines for making decisions. In the other words, rules of judgment produced manually, or conclusions drawn can be biased and not suitable for custom systems. This method is associated with various drawbacks such as the problem of a bottleneck during knowledge processing and inherent problem during the development of user profiles and the linking with existing information. Recommended is an automated knowledge-based system where data feedback may be subjective and may differ according to requirement [34].

2.5. Context-aware filtering

Context-aware RS concentrates on supplementary circumstantial evidence for instance period, place, and wireless sensor nets. It is possible to obtain contextual information unambiguously, unreservedly, utilizing data mining, or using a concoction of these approaches (like a fusion). Moveable solicitations are currently progressively more using topographical info; this info allows environmental RS to be deliberated as a location-aware RS [35].

2.6. Hybrid-based filtering

The hybrid filtering approach is a blend of several recommendation techniques. Many recommenders are now using a cross attitude that incorporates concerted sieving, content-based sieving, and other tactics. Attendance is not motiving why it was not possible to hybridize several different techniques of the same type. Hybrid methods can remain applied in several ways: by independently making and then assimilating content-based and strenuous extrapolations [36].

2.7. Companion Disparagement in Collective Networks per combination

The system proposed discusses the Companion recommendation by hybrid filtering in a Twitter social network. Companion endorsement in public webs has chiefly focused on social relationships and customer interests. Nonetheless, the drawback is that most of the existing solutions (like the Companion of Companion method) overlooked supplementary cherished info, for example, user silhouette, locality, stimulus, and subsidiary reliance [36].

3. Literature Review

Being companions amongst customers is what's more strong-minded by the individual or dualistic leading influences that generate since varying statistics bases. According to the above, this current proposed an accessible context in social connectivity, somewhere numerous foundations have been unified per enhanced conformational theories. Additionally unambiguously, they initially evaluated seven appreciated info bases and classified bases into three main classes, individual topographies, network assembly structures, and Societal topographies.

3.1. Exhausting Multiple Traits to Panel Customers

The Companion recommendation with location-based filtering using a machine learning method in the Foursquare, and Gowalla social networks. Companion reference is a momentous piece of social networks to assist the public to create new users and increase their collective assemblages. Nonetheless, the user-site and consumer-to-consumer info in the position-established societal network is mutually moreover meager which supports the big challenge for the endorsement [37].

The identified state-of-the-art, innovative multiple traits modes per the customer endorsement prototypical are prearranged that considered for example a dualistic cataloging delinquent to wrestle this experiment. They excerpt triple topographies of every consumer through novel approaches individually. The core compactness approximation and info telecommunications are rummage-sale to flat the registration information and highpoint the program glassy of consumers to excavation spatial-temporal topographies.

3.2. An Acquaintance Recommendation Technique Centred on Fine-Grained Predilection

Companion recommendation by collaborative filtering in the Flickr social network. In the cinematography public, consumers are usually requested and reinvigorated to stretch appropriate identifiers grounded over the gratified of the photographs while uploading photos. Identifiers remain frequently satisfying-modicum that may be enhanced jumble-sale to appraise the customer's satisfactory- modicum camerawork darlings aimed at acquaintance recommendation [38]. Nonetheless, this recommendation has a challenge since the newest associated investigations occasionally remuneration consideration to a customer's photography favorites that are satisfactory-modicum, that indications underprivileged acquaintance recommendation.

3.3. Friend Approval Structure Based on Big-Five Persona Personalities and Hybrid Filtering

With hybrid filtering, most of the Companion recommendation systems are friendship-based systems, friendship is the tendency to subordinate and promise to dissimilar others. In supplementary, friendship media plats will commend the communal that you portion conjoint topographies with the identified by way of acquaintances [39].

3.4. Prediction of Preferred Personality in Social Networks

Companion recommendation by content-based filtering using a machine learning method. Notably, the recurrent recent confidante commendation frameworks deliberate solitary the quantity of reciprocated acquaintances, geo-positioning, and reciprocated comforts, among others to endorse a unique individual as an acquaintance to another. Nonetheless, in a factual lifetime, the communities, who have similar traits, incline to develop acquaintances with each other, the request that is absent in the contemporary acquaintance disparagement agendas [40]. Thus, in this state-of-the-art, individuality-based acquaintance commendation contexts are anticipated, which include a three-encrusted synthetic neural system for acquaintance predilection categorization and a detachment-created sorted subcategory variety technique for acquaintance recommendation.

3.4. Acquaintance Recommendation Archetypal Based on Multi-dimensional Theoretical Feature and Thoughtfulness Machinery

The acquaintance approval with content-based filtering using a machine learning method in the SCHOLAT social network. The moot communal system platforms are unrelated to the wide-ranging social network dais. Maximum customers of the theoretical social network dais are investigators (academics) and they have supplementary speculative connected evidence. Since old-style recommendation methods alone reflect the superficial interaction features, it dismisses attain the extra multifaceted and different nonlinear relationship between the aimed consumer and the commendation entry [41].

3.5. A confidentiality-preservative Acquaintance endorsement patterns

The acquaintance commendation with collaborative filtering using a machine learning method and Guarantees user privacy with running security in the meeting social network. The old-style Companion recommendation procedure postures numerous fundamental confidentiality fissures in media connectives, like distinctiveness steal and correlation confidentiality escape [42].

To disentangle this problematic aspect, dissimilar commencing old-style acquaintance recommendation patterns, based on the common interests through determining consumer's communal comportments or doings, they recognize the intimidation archetypes and next offer better nameless acquaintance disparagement patterns.

3.6. Educational Societal Systems Confidant Endorsement Algorithms

The companion recommendation with collaborative filtering using a machine learning method grounded on pronouncement sapling by the contextual of the Scholat, a big accessible speculative societal net establish. The anticipated procedure disentangles the difficulty of acquaintance reference than an expectation of binary class. Firstly, the chin assortment technique, that the Relief and K-means procedure are frequently practical, is secondhand to obliterate the extraneous geographies in the information preprocessing. Subsequently captivating the effective topographies, they custom an erudition archetypal to InterCity the selected statistics [43].

3.7. A Personalized Acquaintance Approval Technique Combining Network Structure Features

The confidant recommendation with content-based filtering using a machine learning method. Recent inquiries on acquaintance reference are mostly constructed on the node's features and method info of the friendship system. The disparagement approaches which

discuss protuberance material are better for significant webs (like the Facebook, Adamic-Adar Index, and Instagram) [44].

3.8. Enlightening Customer Reference by Media Topics Mining and Curiosity Topics of consumers

The system proposed by K. Xu et al. [33] discusses the Companion recommendation with content-based filtering in the Sina-Weibo and Epinions social networks. Uni-directional social networks are situations in which members offer inadequate complement or lack dual functionalities. Similar content tends to use those follower-followee relationships to make recommendations [45]. Nonetheless, a chief delinquent with such approaches is that they conclude that each adherent and those following them to customer pair is correspondingly perspective, in addition, primes to the consumer being coarse succeeding inferring inclinations.

3.9. Societal Connectivity Customer Endorsement Techniques

The Companion recommendation with content-based filtering in the Sina-Weibo social network. Currently, the consumer connection endorsement process is based on correspondence, and insufficient consideration is given to the influence of the user. This state-of-the-art acclaims a new-fangled consumer stimulus assessment prototypical to address this problem, in accumulation on this foundation, a new user affiliation endorsement procedure is anticipated by coalescing correspondence with self-motivated influence [46].

3.10. Confidant Commendation in Position-Grounded Media Connectivity

The companion recommendation with location-based filtering using a machine learning method in the Foursquare and Gowalla and Brightkite social networks. The generation of recommendations from Companions in position-centered media connectivity appears to be a perplexing undertaking, as must absorb how diverse circumstantial influences stimulus the behavior of users to form social relations (Like the circumstantial material of the reception performance of customers in mutual settings, and the accomplishments of customers in nearby regions can affect the relationships of users) [47].

3.11. Disseminated Acquaintance endorsement Confidentiality

Companion recommendation with content-based filtering using a machine learning method and Guarantees user privacy with running security in the Facebook social network. Based on the large social data, existing recommender systems frequently engage a consolidated framework that would cause a lot of glitches, for example, solitary opinion catastrophe, announcement logjam, and so on; see [48].

3.12. An Amended Apriority-based procedure for Acquaintances Endorsement in microblog

The Companion recommendation with collaborative filtering using a machine learning method in the Sina-Weibo social network. This state-of-the-art focuses on how to give customers holding a corporate interest in broadcast media a recommendation. They first explained an approximately acclaimed set of rules per information excavating, and also the fulfillment progression of the confidante commended scheme is so offered [49].

3.13. Enmity Recommendation System Using Topological Structure of Social Networks

The companion recommendation by collaborative filtering in the Twitter social network. This study offers two algorithms for a Companion recommended. The first algorithm is based on the number of reciprocal companions and the second algorithm is based on an influence score. Using collaborative filtering, these recommendation algorithms offer the idea of making recommendations [50].

3.14. Companion Endorsement in Virtual Communal Nets Conjoining Curiosity Match and Societal Communication

The companion recommendation by collaborative filtering in the Tencent social network. The most traditional methods of recommending companions in online social networks cannot meet the requirements of consistency and timeliness at the same time. Cutting-edge this approach, a confidante endorsement of new tactic incorporates desire-centered topographies and associativity-centered logical layouts with rectilinear interval complications that were designed to take jam-packed benefit of the dormant conjugate prior apportionment [50].

3.15. Assimilating Prejudiced Regular Technique for Semantic Acquaintance Reference

Most current Companion-recommendation approaches use customer silhouettes, societal associativity, or immobile stake contented data; nonetheless, infrequently involve the user's semblance intentions and dynamic behaviors [51]. This state-of-the-art, a new approach for a

Companion recommended based on semantic and dynamic information offers, the name is FRec++.

3.16. Temporal public-to-public endorsements

The Companion recommendation with collaborative filtering using a machine learning method in the Twitter social network. Common recommenders do not see individuals as sharing similar interests since may have variant sentiments or views about them. This state-of-the-art, therefore offers a novel recommendation engine focused on the identification of semantic attitudes, i.e. sentiment, volume, and objectivity, extracted from content generated by the user [52].

3.17. Confidante Approval System per Mobile Documents

The Companion recommendation with collaborative filtering using a machine learning method. This state-of-the-art proposes a Companion Recommendation System for social networks to calculate the level of user activity and to adjust the dataset matching to the repeat and intensity of their operation. They used the K-Nearest Neighbor algorithm; user activity and habits can also be easily categorized through certain parameters [53].

3.18. Confidante Recommendation System per Geolocation and Contents of Customers

Existing social software may currently recommend other users in the neighborhood depending on the user's geographic location. Nonetheless, these approaches do not discuss the user's interests, and hobbies, among others. Therefore, the usefulness of such a recommendation system for Companions is often unsatisfactory. To solve the above questions, a custom Companion recommendation system is made based on location information and user content [54].

3.19. A Competent Privacy-Preserving Confidante Endorsement Arrangement

The companion recommendation with Guarantees user privacy with running security on Sina-Weibo social network. This state-of-the-art offers a harmless and competent endorsement arrangement for confidantes based on the protocol for privacy conservation to circumvent the haphazardness and unpredictability of an endorsement for acquaintances in communal webs [55].

3.20. Theoretical Privacy-Preserving Acquaintance Recommendations

The system companion recommendation with Guarantees user privacy. Many new recommendation systems for Companions are that the available network at the expense of privacy. In fact, because of such suggestions, a Companion graph of any given user may be leaked directly or indirectly. This is not ideal in many cases since the acquaintance list can disclose a lot approximately the customer from their distinctiveness to their sexual alignment and comforts [56].

3.21. Companion Recommendation Algorithm Based on Fragmentation of Time and Transmission of Interest

To solve the problem of low recommendation quality, which stems from the fact that the conventional algorithm cannot dynamically create user recommendations and gather information, the state-of-the-art put forward a Companion recommendation algorithm based on time fragmentation and interest transfer [57]. Firstly, the state-of-the-art partitions the user's time into multiple periods and computes the foremost push time.

3.22. Companion Recommendation in Online Social Networks

The confidante recommendation by hybrid filtering in the Epinions and Facebook and Wiki dataset. The public may want to create new Companions in online social networks to maximize their social influences. This research, therefore, provides a recommendation technique for a Companion with the perspective of optimizing social influence [58].

3.23. An Acquaintance Endorsement Archetypical

The companion recommendation by location-based filtering in the Foursquare and Gowalla and Brightkite communal complexes. LBSN especially possesses the spatial-chronological feature. Nonetheless, not any of the common ways fully use all the three features that can principal to truncated disparagement meticulousness, these common ways are generally bungling [59].

3.24. A user intention modeling algorithm for Companion recommendation

The companion recommendation with hybrid filtering in Library Thing social network. They tackle the problem in this state-of-the-art by considering it as a task of linkage expectation and proposing a cross-process that achievement the existing links of companionship, the antiquity evaluations of consumers, and the tags interpreted to items. In particular, they recognize the

fundamental collections in the communal system based on variant phases and inducement of the geographies that definite the immersion notch of the consumers to the assemblages [60].

3.25. Companion Recommendation Considering Predilection Coverage

Companion recommendation by location-based filtering in the Foursquare and Gowalla social networks. The majority of common Companion recommendation approaches usually focus on the likeness of interests and mutual Companions between users to better the quality of recommendations. Different customers are prospective to have comparable point-of-attentiveness interests, the types of evidence they provide are restricted and terminated, and they cannot envelop all the point-of-attentiveness preferences of the target user [61]. The goal of this state-of-the-art is to progress the quantity of info on consumers' favorites by companions' commendation.

3.26. A Secure Online Based Companion Recommendation System for Social Network

This state-of-the-art addressed Companion Recommendation Services based on The Modern Operation. Common social networking service recommends Companions to users based on their social graphs and contacts, which may not be the most suitable to indicate a user's taste in real-life Companion selection. This state-of-the-art offers an approach that recommends Companions based on users ' everyday operations [62].

3.27. Companion Recommendation Algorithm Based on Interest Classification with Time Decay

The companion recommendation with hybrid filtering in Sina-Weibo social network. Current recommendation algorithms do not take into account the wandering of user preferences and there are also some limitations when considering the timeliness of the recommendation. Targeted at this problem, the similarity calculation approach was improved through the merge with the feature of the shift in user interest over time [63].

3.28. A Study for Companion Recommendation Based on User Behaviour

The original types of social networking sites are those providing category places, ways of communicating with Companions, and a trust-linked recommendation system. The goal behind this state-of-the-art is to prospect the user's lifestyle from their daily actuality and user transactions and recommend more relative and good suggestions for Companions beyond their thinking [64].

3.29. Multiple-Level Perceptron Classifier and Paillier Encryption Arrangement for Companion

Companion recommendation uses a machine learning method and Guarantees user privacy with running security in the Facebook social network. Societal schmoozing sites include confidentiality issues and security as well. Nevertheless, customers need to interconnect through innovative acquaintances to establish their social relationships and similarly to obtain data from a specific collection of public. Companion endorsement performance has become identically prevalent freshly so approximately the operational societal systems can denote this attitude [65].

3.30. Dualistic-Platform Acquaintance Endorsement per Web

The scheme anticipated and discourses the companion commendation with collaborative filtering in the Flickr social network. This state-of-the-art offered a Companion recommendation approach with two stages. Firstly stage, they make parallel diverse media nets and select approximately "conceivable acquaintances" through using the material about the correlation amongst typescripts and consumers, and info about consumers' camaraderie as well. Secondly stage, they are developing a topic model with the link between image features and users to further refine the results of the recommendation [66].

3.31. An Efficient Way of Companion Recommendation Using Secure Social Networking

Companion recommendation with hybrid filtering and Guarantees user privacy. This state-of-the-art suggests that Companion's system of discovery could also be a social networking service to help the public build new Companions [68]. For alternative Companions, therefore, within the given they tend to propose a Companion recommendation framework that is supported on Associate in the user's profile, user's lifestyle, ratings, and comments provided by Companions and also includes the existence and actions of the user that we tend to implement besides social network protection.

3.32. Customer Affiliation forte exhibiting for Companion endorsement on Social media

Companion recommendation with content-based filtering using a machine learning method in the Instagram social

network. This state-of-the-art introduces a new framework for understanding the fundamental power of social relations. Understanding the user relationship from multiple perspectives and modeling the interaction strength are combined into one method system. Also, a coarse-to-fine approach is recommended for the advice of Companions provided by the established nature of the relationship [69].

3.33. Incorporating a weighted-average technique into the arbitrary walk framework

The Companion recommendation by context-aware filtering in the Sina-Weibo social network. These state-of-the-arts offer initial comprehensive surveys on dynamics that disturb the effects of recommendations. Firstly, they designed acquaintance-plus, a multi-personal cross disparagement prototypical that incorporates a subjective routine into the unsystematic approach structure by effortlessly incorporating social stalemates, behavioral perspective, and personal data. The primary plus in acquaintance-plus means applauding a fresh confidante over network features while another plus stands for the use of node topographies [68].

3.34. Companion Recommendation Android Application Using Behaviour and GPS Technology

This study, offers a "Confidant book", a novel semantic-established acquaintance endorsement framework for social networks that applaud confidantes to users centered on their lifestyles rather than social graphs. By using sensor-rich smartphones and offering two extra features of recommendations like recommendations for multiple locations that users can visit such as hotels, shops, or some places, etc [69].

3.35. Path-Identical Extrapolation for Companion Endorsement

The Companion recommendation by location-based filtering in the Ledongli social network. This state-of-the-art, formulating a granularity trajectory-identical confidante endorsement interrogation in asparagine synthetizes - anything is the probability that dual customers will meet separately supplementary in the future based on their chronological arc? To measure the similarity between trajectories of dualistic consumers, they describe the providence of binary arcs in mutually altitudinal and sequential realms and recommend a system that applauds candidate acquaintances to a customer by estimating the similitude of their routes [70].

3.36. BayDNN: Acquaintance Approval by Bayesian

The system proposed in [71] discusses the Companion recommendation with content-based filtering using a machine learning method in the Slashdot and Epinions social networks. This state-of-the-art offers a Bayesian Personalized Deep Neural Network (BayDNN) model for a social network Companion recommendation. Firstly, BayDNN discovers latent structural patterns from data from the input network, and next uses the Bayesian ranking to create Companion recommendations.

3.37. Acquaintance Recommendation System for Virtual Social Webs using Cohesion per Approach

Companion recommendation with content-based filtering in the Twitter social network. This state-of-the-art suggests a Companionly recommendation system called a cohesion-based recommendation system in which a new Companion is recommended based on a certain confidence value determined based on a few existing parameters. The cohesion of two or more attributes is used in this work to make a recommendation decision. This work is suggested for a user who travels to study in another country and suggests the user to the residents as relatives [72].

3.39. Companions Wall: Linguistic-Centered Companion Reference Nets

The system [73] discusses the Companion recommendation with context-aware filtering using a machine learning method in the cyber-physical dataset. This study introduces Companionswall, a semantic-based social networking Companion recommendation program that offers users Companions based on their lifestyles rather than social activities. Through obtaining the advantage of sensor-rich smartphones, Companionswall finds user-life styles, analyzes user-like lifestyles, and suggests user-Companions if their lifestyles are similar.

4. Comparative Study

In this section, a reasonable examination of acquaintance reference systems has been performed in the nonfiction. Friend recommendation systems needed to require one of six filtering methods. For each of the 6 recommended systems, different algorithms and methods of data mining, machine learning, and deep learning can be used.

4.1. First dimension: Type of Companion recommendation method

In this section, we describe the first Grouping of state-of-the-arts. By reviewing the aforementioned series of state-of-the-art, which comprise about 70% of Companion recommendations state-of-the-art, we found that the knowledge-based recommendation method was much less used than the other methods. Collaborative filtering and hybrid-based filtering recommendation methods are more popular because of their good accuracy derived from their information. If we want to rank among the different methods of Companion recommendation according to the state-of-the-arts, That's how the first hybrid filtering, the second collaborative filtering, the third content-based filtering, the fourth location-based filtering, the fifth context-based filtering, and the sixth knowledge-based filtering.

4.2. Second dimension: Generic template Companion recommendation

In this section, we outline a general format that is followed in most state-of-the-arts in Table 2. We obtained an important conclusion by reviewing numerous state-of-the-arts. Most Companion recommendation systems offer Companions to the user by using table 2 (Companion recommendation flowchart).

4.2.1. Feature selection from social network

In this level, we extract from within the desired social network a variety of features. These features represent different information. Features vary across different social networks. Features are the same services that social networks provide to their users.

4.2.2. Obtain a Graph of users' communication

This level has not a special place. It is better to obtain this graph in the early levels of this flowchart. This graph helps us to get a lot of users' communication. In this graph, each user represents a node and the relationship between users with the edges between nodes is expressed. We have 2 ways to enjoy this graph and recommend it to our target user.

5. Evaluation of Dataset State-Of-The-Arts Social Medias

In the following section, the different classification of social systems is presented. Social networks give us different data depending on their different services. Different social networks are differentiated by location, interests, and lifestyle of users, gender.

5.1. Twitter

Twitter refers to an American microblogging and media interaction site on which consumers stake messages known as "tweets" and communicate. Registered users can post and retweet tweets, but they can only be read by unregistered users [74].

5.2. Facebook

This is one of the most widespread unrestricted media interacting site platforms which enables enumerated customers to generate silhouettes of their desires and wishes, relocate data from one page to another image, besides videos, and direct memorandums, and keep in touch with acquaintances, people, and contemporaries [75].

5.3. Instagram

Instagram is an American social networking site owned by Facebook, Inc. for photo and video sharing. Based on the research results of this study, it is observed that Instagram has a significant impact on sales, in that, it increases branding and establishes loyal relationships. This results in increasing the profit of a business; when it comes to online advertising and shopping, Instagram can help in driving traffic, and convert would have been Instagram followers into customers [76]. Also, maximize the click-through rates, which will ensure that the Instagram followers are visiting the online store. As a result, they are more likely to buy from you since they like your personality.

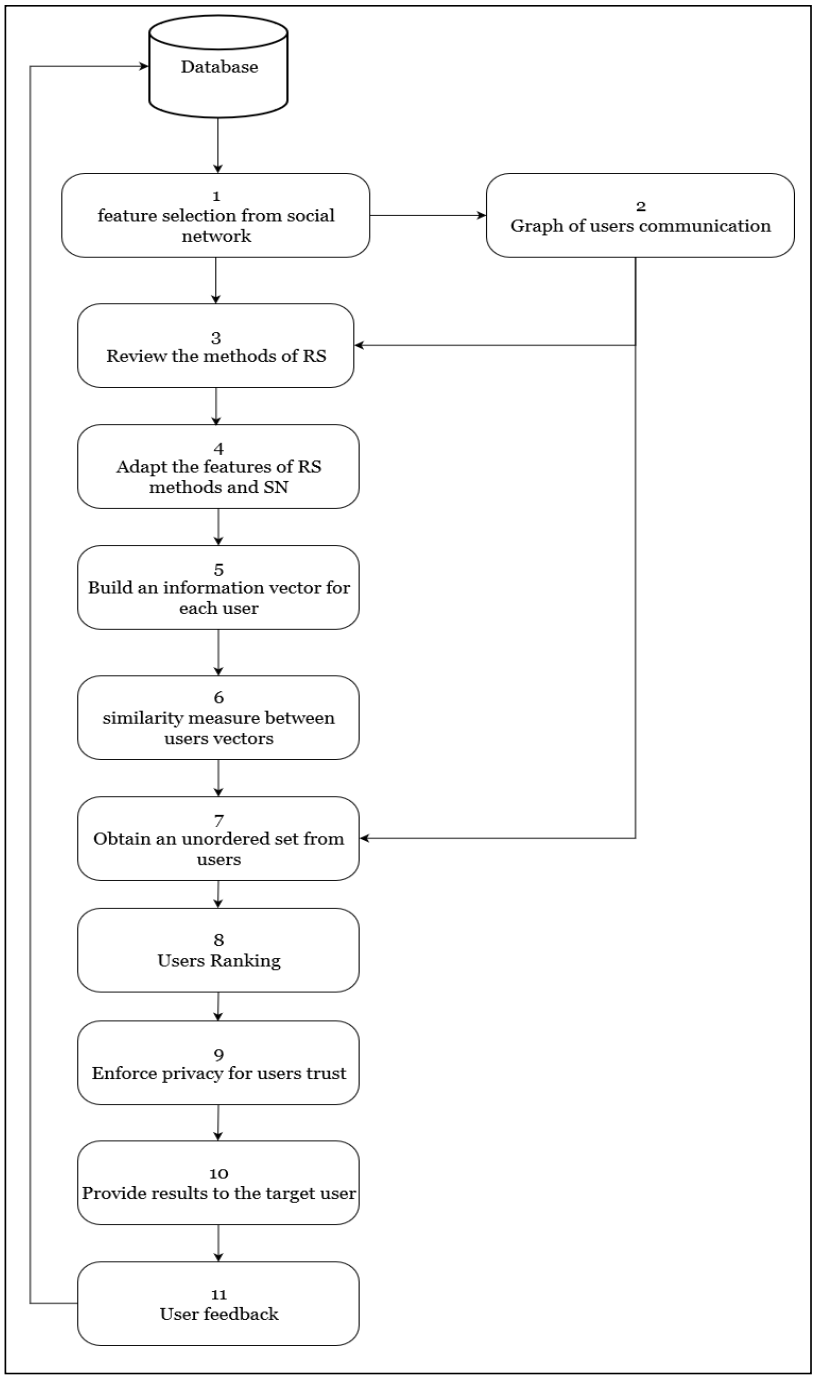

Figure 2. Generic template Friend recommendation

Local businesses can also benefit from Instagram, as you may ask Instagram followers to share images, to check in to the location, which will increase the visibility of your business on social media networks [76]. We have described the most common flow of social networking according to Figure 2.

5.4. Foursquare

Foursquare City Guide is a local mobile search-and-discovery app created by Foursquare Labs Inc., commonly known as Foursquare [77]; Table 1 demonstrates the Classification of state-of-the-art recommendation Techniques.

Table 1. Classification of state-of-the-arts Technique

	1	2	3	4	5	6	7	8
	Content-based filtering	Collaborative filtering	Context-aware filtering	Location-based filtering	Knowledge-based filtering	Hybrid filtering	Using machine learning method	Guarantees user privacy and Trust-based recommendation
[1]						*		
[2]				*			*	
[3]		*						
[4]						*		
[5]	*						*	
[6]	*						*	
[7]		*					*	*
[8]		*					*	
[9]	*						*	
[10]	*							
[11]	*							
[12]				*			*	
[13]	*						*	*
[14]		*					*	
[15]		*						
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[17]						*		
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[27]				*				
[28]			*					
[29]						*		
[30]						*		
[31]							*	*
[32]		*						
[33]						*		*
[34]	*						*	
[35]			*					
[36]			*					
[37]				*				
[38]	*						*	
[39]	*							
[40]			*				*	

Table 2. Classification of state-of-the-art Datasets

	Twitter	Foursquare	Gowalla	Flickr	SCHOLAT	Sina Weibo	Slashdot	Epinions	Brightkite	Instagram	maitang	Facebook	Tencent	Gooseeker	Wiki	LibraryThing	Ledongli	cyberphysical	Users' lifestyle data
[1]	*																		
[2]		*	*																
[3]				*															
[4]																			*
[5]																			*
[6]					*														
[7]											*								
[8]					*														
[9]																			*
[10]						*		*											
[11]						*													
[12]		*	*						*										
[13]												*							
[14]						*													
[15]	*											*							
[16]													*						
[17]						*													
[18]	*																		
[19]																			*
[20]																			*
[21]						*													
[22]																			*
[23]														*					
[24]								*				*			*				
[25]		*	*						*										
[26]																*			
[27]		*	*																
[28]																			*
[29]						*													
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[31]												*							
[32]				*															
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[34]										*									
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[37]																	*		
[38]							*	*											
[39]	*																		
[40]																		*	

5.5. Gowalla

Gowalla was a local social network that was founded in 2007 and closed in 2012. In their immediate area, users were capable of reception at "Acnes," whichever from side to side an enthusiastic peripatetic solicitation the itinerant website [78]; we present the classification of state-of-the-art datasets of each method in Table 2.

5.6. Flickr and Scholat

Flickr is a website for image sharing and video streaming. SCHOLAT is introduced refers to academic-adapted media connectivity aimed at creating a hypothetical

community to facilitate customers to connect with other academics. The SCHOLAT offers two innovative professional services, XPSearch and XSRecom, which are useful to researchers [79].

5.8. Sina-Weibo

Sina-Weibo is a Web site for Chinese microblogging. Sina-Weibo is a forum for exchanging, disseminating, and receiving information focused on promoting user relationships. Users can upload images and videos online for instant sharing through either the website or the mobile app, with other users being able to comment through text, pictures, and videos, or using an instant messaging application for multimedia [80].

5.9. Slashdot

Slashdot is a website for social news that was initially marketed as "News for Nerds." It features news stories about science, technology, and politics submitted and reviewed by website users and publishers. That story is followed by a comment section where users can add comments online [81].

5.10. Epinions

Epinions were a site established in 1999 for general consumer reviews. In 2003 Shopping acquired Epinions that in seizure existed assimilated in 2005 through eBay. Using this platform, invitees were able to declaim novel and ancient criticisms on an assortment of items to aid the invitees choose on what to buy [82].

5.11. Brightkite

Brightkite was a place-based website for social networking. Users were able to "check-in" at locations using text messaging or one of the mobile applications and were able to see who was in the vicinity and who was before [83].

5.12. Tencent

Tencent Holdings Limited is a multinational Chinese conglomerate holding company established in 1998, whose subsidiaries are specialized in various services and products related to the Web, entertainment, artificial intelligence, and technology both in China and globally [84].

5.13. Wiki

A wiki simply refers to a platform with an information base that users work self-possessed to modify and consolidate satisfaction unswervingly from a web browser using the different search engines. The edition is engraved using complex markup semantics in an outmoded wiki and is frequently modified with the aid of rich-edition editors. A wiki is run by the wiki software, which is otherwise known as a wiki engine [85].

5.14. LibraryThing

LibraryThing is a web application for social cataloging to store and exchange book catalogs and different types of book metadata. It is used by publishers, authors, and, libraries as in [86].

5.15. Ledongli

Ledongli is a wearables company and an online fitness app. The company has its headquarters in Beijing, China. Charts can be found on different organizational profiles and Hubs sites, depending on the availability of data. Next, we have categorized state-of-the-arts based on data of diverse media connectivity (table 2). Most of this data is for the context-based user recommendation method [88-96].

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