

SURVEY PAPER ON APP RECOMMENDATION SYSTEM BY LEARNING USER'S INTEREST FROM SOCIAL MEDIA

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Abstract: The popularity and development of mobile devices and mobile apps have dramatically changed human life. Due to the tremendous and still rapidly growing number of mobile apps, helping users find apps that satisfy their demands remains a difficult task. To address this problem, we propose a personalized mobile app recommender system based on the textual data of user social Media i.e., public accessible tweets, which can also reflect user's interest and make up for the sparsity of app usage data. Topic modelling techniques are applied to extract topics of user social media data, and the probability distributions of the topics are utilized to represent the features of the apps. Then, the user profile is constructed based on the user's interest to capture user preferences. Both the topic distributions of the apps and user preferences are taken into account to produce recommendation scores to generate recommendation lists for target users. We crawl real-world data sets from Twitter to evaluate the performance. The experimental results show that user social data i.e., tweet is effective for deriving the user interest, and the proposed app recommender system improves the performance of existing approaches.

Keywords - *App recommendation, social media, transfer learning, collaborative filtering.*

I INTRODUCTION

The popularity and advancement of smartphones and mobile apps have brought considerable convenience to human life. A substantial number of mobile apps have been developed to assist users in various types of tasks, such as production, entertainment, and exercise. Millions of apps are available for downloading from the Apple App Store and Google Play Store. With such a tremendous and still rapidly growing number of mobile apps, users face difficulty in finding appropriate apps, and only a few apps have the chance to be exposed to users. Hence, helping users to find apps that meet their demands is a critical issue.

Recommender systems have been widely adopted by many online websites to help customers overcome the information overload problem and make their purchase decisions. Popular recommendation techniques, such as collaborative filtering (CF) and content-based filtering, can be utilized in app stores for users to search relevant apps. CF makes recommendations based on the assumption that customers with similar ratings and interests for some items are likely to have similar preferences for other items. Content-based filtering assumes

that the users' interests are able to be represented by the content of items they have shown interest in, and those items that have content descriptions similar to the target user's favourite items are recommended.

In this paper, we capitalize on user reviews to understand the functionalities of apps from the users' perspective and leverage user reviews to develop an app recommender system. The topics hidden in the review texts can be a type of representation of the app features. We collect user reviews from app stores to perform topic modelling and represent each app as the probabilities of topic distributions. Then, user preference is inferred from the topic distribution of the user's consumed apps to construct the user profile. Since there are features the user will like or dislike, we further consider the sentiments related to topics, which helps to find favourable apps and avoid disliked apps. The topic distributions of apps and user preferences are both considered when producing recommendation scores of the relevant apps for the user to make personalized recommendations.

II. RELATED WORK

Sr No	Paper Title	Authors	Publication Year	Algorithms	Conclusion
1	Personalized Mobile App Recommendation by Learning User's Interest from Social Media	Zhen Tu, Yong Li, Pan Hui, Li Su, Depeng Jin	IEEE TRANSACTION S ON MOBILE COMPUTING MAY 2020	Matrix Factorization	In this paper, author demonstrate that it is possible to make personalized app usage estimation by learning user's app preference from the social media, i.e., public accessible tweets, which can also reflect user's interest and make up for the sparsity of app usage data. By proposing a novel generative model named IMCF+ to transfer user interest from rich tweet information to sparse app usage, authors achieve personalized app recommendations via learning the interest's correlation between apps and tweets.
2	FARM: A Fairness Aware Recommendation Method for High Visibility and Low Visibility Mobile APPs	Qiliang Zhu, Qibo Sun, Zengxiang Li, Shangguang Wang	IEEE 2020	Roulette wheel Algorithm	The proposed method (fairness - aware app recommendation method) shows good performance in term of fairness which can discover excellent apps among low visibility apps rapidly and improve user satisfaction
3	Recommendations for mobile apps based on the HITS algorithm combined with association rules	Xiangliang Zhong, Yiwen Zhang, Dengcheng Yan, Qilin Wu, Yuan Ting Yan, Wei Li	IEEE 2019	HITS	It integrates user ratings to iteratively calculate authority and hubs scores, then combines the result with the association rules. Apriori algorithm is improved hence time overhead is large. Efficiency of mining association rules is not high when facing large data.
Sr. No	Paper Title	Authors	Publication Year	Algorithms	Conclusion
4	DPLink: User Identity Linkage via Deep Neural Network From Heterogeneous Mobility Data	Jie Feng , Mingyang Zhang , Huandong Wang , Zeyu Yang , Chao Zhang, Yong Li , Depeng Jin	ACM 2019	LSTM	In this paper, author propose DPLink, an end-to-end deep learning-based framework, to complete the user identity linkage task for heterogeneous mobility data collected from different services with different properties.
5	Information Recommendation Based on Domain Knowledge in App Descriptions for Improving the Quality of Requirements	Yuzhou Liu, Lei Liu, Huaxiao Liu, Suji Li	IEEE 2019	DRDM	The results show that approach can identify the existing products with initial requirements reasonably, and also indicate that the developers

					confirm the usefulness of the recommended information in practice. proposed approach can identify the existing Apps that satisfy a given requirement reasonably with average F-Measure 80.58%
6	Smartphone app usage prediction using points of interest	DONGHAN YU, YONG LI, FENGLI XU, PENGYU ZHANG, VASSILIS KOSTAKOS	ACM 2018	matrix factorization techniques	In this paper author present the first population-level, city-scale analysis of application usage on smartphones. Using deep packet inspection at the network operator level, we obtained a geo-tagged dataset with more than 6 million unique devices that launched more than 10,000 unique applications across the city of Shanghai over one week. We develop a technique that leverages transfer learning to predict which applications are most popular and estimate the whole usage distribution based on the Point of Interest (POI) information of that particular location
Sr. No	Paper Title	Authors	Publication Year	Algorithms	Conclusion
7	Leveraging Online Word of Mouth for personalized app recommendation	<u>Keng-Pei Lin</u> , <u>Yi-Wei Chang</u> , <u>Chih-Ya Shen</u> , <u>Mei-Chu Lin</u>	IEEE 2018	Non-negative Matrix Factorization	Topic modelling approach is applied. Future search includes an ensemble with latent factor models and exploiting more sophisticated ensemble methods such as gradient boosting tree.
8	Learning Personalized Preference of Strong and Weak Ties for Social Recommendation	Xin Wangyz Steven C.H. Hoix Martin Esterz Jiajun Buy Chun Chen	ACM 2017	matrix factorization	In this paper, authors first highlight the importance of different types of ties in social relations originated from social sciences, and then propose a novel social recommendation method based on a new Probabilistic Matrix Factorization model that incorporates the distinction of strong and weak ties for improving recommendation performance.
9	Discovering Different Kinds of Smartphone Users Through Their Application Usage Behaviors	Sha Zhao ^{1,2} , Julian Ramos ² , Jianrong Tao ¹ , Ziwen Jiang ¹ , Shijian Li ¹ , Zhaohui Wu ¹ , Gang Pan ¹ , Anind K. Dey ²	ACM 2017	Clustering algorithms	In this work, author challenge these elementary characterizations of smartphone users and show evidence of the existence of a much more diverse set of users. Author analyzed one month of application usage from 106,762 android users and discovered 382 distinct types of users based on their application usage behaviors, using our own two-step clustering and feature ranking selection approach.

10	Differentiating Smartphone Users by App Usage	PascalWelke, Ionut And one, Konrad Błaszkiwicz, Alexander Markowetz	ACM 2017	Usage Patterns	in this paper, author show that it is possible to differentiate users via their set of used apps, their app signature. To this end, author investigate the app usage of 46726 participants from the Mental project.
Sr. No	Paper Title	Authors	Publication Year	Algorithms	Conclusion
11	Prediction of User App Usage Behavior from Geo-Spatial Data	Xiaoxing Zhao, Yuanyuan Qiao, Zhongwei Si, Jie Yang, Anders Lindgren	ACM 2017	Random forest	In this paper, author propose a method based on machine learning to predict users' app usage behavior using several features of human mobility extracted from geo-spatial data in mobile Internet traces. The core idea of our method is selecting a set of mobility attributes (e.g., location, travel pattern, and mobility indicators) that have large impact on app usage behavior and inputting them into a classification model.

III OPEN ISSUES

Lot of work has been done in this field because of its extensive usage and applications. In this section, some of the approaches which have been implemented to achieve the same purpose are mentioned. These works are majorly differentiated by the algorithm for Mobile App Recommendation systems.

The popularity and advancement of smartphones and mobile apps have brought considerable convenience to human life. A substantial number of mobile apps have been developed to assist users in various types of tasks, such as production, entertainment, and exercise. Millions of apps are available for downloading from the Apple App Store and Google Play Store. With such a tremendous and still rapidly growing number of mobile apps, users face difficulty in finding appropriate apps, and only a few apps have the chance to be exposed to users. Hence, helping users to find apps that meet their demands is a critical issue.

IV. PROPOSED SYSTEM

- Step 1: Facebook Data collection using Facebook streaming API and Facebook comments collection using online tools like extract comments.com, etc.
- Step 2: Data preprocessing like removal of duplicate posts, stop words.
- Step 3: Data normalization using porter stemming algorithm.
- Step 4: Data loading on Dataset.
- Step 5: Design and Implementation of program for per day frequency of posts.
- Step 6: Design and Implementation of program for feature selection.
- Step 7: Facebook post Classification.
- Step 8: Mobile app recommendations.

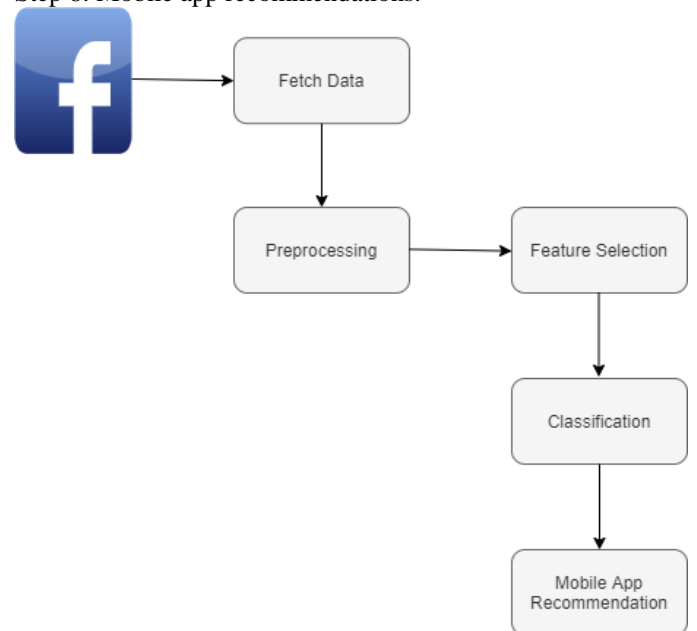


Figure. System Architecture

V CONCLUSION

In this paper, we leverage the information of user social media to design a personalized app recommender system. The topic modeling approach is applied to extract topics from the huge amount of textual data in user social data to model the features of apps, and the user's installed apps are capitalized to build the user profile to model user preferences. Both the user preferences and app features are taken into account to estimate the personalized app recommendation scores. Real-world data are utilized to perform experiments, and the experimental results show that the user reviews are effective for personalized app recommendations.

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