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Connecting OSN Media to E-commerce for Cold Start Product Recommendation using Micro Login Information

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Abstract: In recent years, the boundaries between e-commerce and convivial networking have become increasingly blurred. Many e-commerce websites support the mechanism of gregarious authenticate where users can sign on the websites utilizing their gregarious network identities such as their Face book or Twitter accounts. Users can withal post their incipiently purchased products on micro blogs with links to the e- commerce product web pages. In this paper, we propose a novelsolution for cross-site cold-start product recommendation, which aims to recommend products from e-commerce websites to users at convivial networking sites in cold-start situations, a quandary which has infrequently been explored afore. A major challenge is how to leverage cognizance extracted from gregarious networking sites for cross-site cold-start product recommendation. We propose to use the linked users across gregarious networking sites and e-commerce websites (users who have gregarious networking accounts and have made purchases on e-commerce websites) as a bridge to map users' gregarious networking features to another feature representation for product recommendation. In categorical, we propose learning both users' and products' feature representations (called utilizer embedding and product embedding, respectively) from data accumulated from e-commerce websites utilizing recurrent neural networks and then apply a modified gradient boosting trees method to transform users' gregarious networking features into utilizer embedding.

Keywords: E-Commerce, Product Recommender, Product Demographic, Microblogs, Recurrent Neural Networks.

I. INTRODUCTION

In recent years, the boundaries between e-commerce and social networking have become increasingly blurred. E-commerce websites such as eBay features many of the characteristics of social networks, including real-time status updates and interactions between its buyers and sellers. Some e-commerce websites also support the mechanism of social login, which allows new users to sign in with their existing login information from social networking services such as Facebook, Twitter or Google+. Both Facebook and Twitter have introduced a new feature last year that allow users to buy products directly from their websites by clicking a "buy" button to purchase items in adverts or other posts. In China, the e-commerce company ALIBABA has made a strategic investment in SINA WEIBO1 where ALIBABA product adverts can be directly delivered to SINA WEIBO users. With the new trend of conducting e-commerce activities on social networking sites, it is important to leverage knowledge extracted from social networking sites for the development of product recommender systems. In this paper, we study an interesting problem of propose products from e-commerce websites to users at social networking sites who do not have historical purchase records, i.e., in "cold-start" situations. We called this problem cross-site cold-start product production. Although online product recommendation has been extensively studied before [1], [2], [3], most studies only focus on constructing solutions within certain e-commerce websites and mainly utilize users' historical transaction records.

To the best of our knowledge, cross-site cold-start product recommendation has been rarely studied before. In our problem setting here, only the users' social networking information is available and it is a challenging task to transform the social networking information into latent user features which can be effectively used for product recommendation. To address this threat, we represent to use the linked users across social networking sites and e-commerce websites (users who have social networking accounts and have made purchases on e-commerce websites) as a bridge to map users' social networking features to latent features for product recommendation. In specific, we represent learning both users' and products' feature representations (called user embeddings and product embeddings, respectively) from data collected from ecommerce websites using recurrent neural networks and then apply a modified gradient boosting trees method to transform users' social networking features into user embeddings. We then develop a featurebased matrix factorization approach which can leverage the learnt user embeddings for cold-start product recommendation. We built our dataset from the largest Chinese microblogging service SINA WEIBO2 and the largest Chinese B2C e-commerce website JINGDONG3, containing a total of 20,638 linked users. The experimental results on the dataset have shown the feasibility and the effectiveness of our proposed framework. Our major contributions are summarised below:

- We formulate a novel problem of recommending products from an e-commerce website to social networking users in "cold-start" situations. To the best of our knowledge, it has been rarely studied before.
- We propose to apply the recurrent neural networks for learning correlated feature representations for both users and products from data collected from an e-commerce website.
- We propose a modified gradient boosting trees method to transform users' microblogging attributes to latent feature representation which can be easily incorporated for product recommendation.
- We propose and instantiate a feature-based matrix factorization approach by incorporating user and product features for cold-start product recommendation.

II. LITRATURE SURVEY

A. Opportunity Model For E-Commerce Recommendation: Right Product; Right Time
Author:-J. Wang and Y. Zhang
Description: Most of existing e-commerce suggester systems aim to recommend the proper product to a user, supported whether or not the user is probably going to buy or sort of a product. On the opposite hand, the effectiveness of recommendations conjointly depends on the time of the advice. Allow us to take a user World Health Organization simply purchased a laptop computer as an example. She might purchase a replacement battery in a pair of years (assuming that the laptop computer's original battery typically fails to figure around that time) and get a brand new laptop in another a pair of years. During this case, it's not a decent plan to suggest a brand new laptop computer or a replacement battery right when the user purchased the new laptop computer. It may hurt the user's satisfaction of the recommender system if she receives a doubtless right product recommendation at the incorrect time. We have a tendency to argue that a system mustn't solely suggest the foremost relevant item, however conjointly suggest at the proper time.

B. Retail Sales Prediction And Item Recommendations Using Customer Demographics At Store Level
Author: M. Giering
Description: This paper outlines a retail sales prediction and products recommendation system that was enforced for a sequence of retail stores. The relative importance of client demographic characteristics for accurately modeling the sales of every client kind square measure derived and enforced within the model. Knowledge consisted of daily sales data for 600 product at the shop level, broken out over a collection of non-overlapping client varieties. A recommender system was designed supported a quick on-line skinny Singular worth Decomposition. It's shown that modeling knowledge at a finer level of detail by clump across client varieties and demographics yields improved performance compared to one mixture model designed for the complete dataset. Details of the system implementation square measure represented and sensible problems that arise in such real-world applications square measure mentioned.

C.Amazon.com Recommendations: Item-To-Item Collaborative Filtering
Author:-G. Linden, B. Smith, and J. York
Description: Recommendation algorithms area unit best glorious for his or her use on e-commerce internet sites, wherever they use input a couple of customer's interests to come up with an inventory of suggested things. Several applications use solely the things that customers purchase and expressly rate to represent their interests, however they'll additionally use alternative attributes, together with things viewed, demographic information, subject interests, and favourite artists. At Amazon.com, we tend to use recommendation algorithms to change the web store for every client. the shop radically changes supported client interests, showing programming titles to a engineer and baby toys to a replacement mother. There area unit 3 common approaches to resolution the advice problem: ancient cooperative filtering, cluster models, and search-based strategies. Here, we tend to compare these strategies with our algorithmic program, that we tend to decision item-to-item cooperative filtering.

D. The New Demographics And Market Fragmentation
Author:-V. A. Zeithaml
Description: The underlying premise of this text is that dynamic demographics can result in a breakage of the mass markets for grocery product and supermarkets. A field study investigated the relationships between five demographic factors-sex, feminine operating standing, age, income, and matrimonial status-and a large vary of variables related to preparation for and execution of food market looking. Results indicate that the demographic teams dissent in important ways that from the standard food market shopper. Discussion centers on the ways in which dynamic demographics and family roles might have an effect on retailers and makers of grocery product.

E. We Know What You Want To Buy: A Demographic-Based System for Product Recommendation on Microblogs
Author:- W. X. Zhao, Y. Guo, Y. He, H. Jiang, Y. Wu, and X. Li
Description: Product recommender systems square measure usually deployed by e-commerce websites to boost user expertise and increase sales. However, recommendation is proscribed by the merchandise data hosted in those e-commerce sites and is barely triggered once users square measure playing e-commerce activities. During this paper, we tend to develop a completely unique product recommender system known as breed, a merchandiser Intelligence recommender System, that detects users' purchase intents from their microblogs in close to time period and makes product recommendation supported matching the users' demographic data extracted from their public profiles with product demographics learned from microblogs and on-line reviews. Breed distinguishes itself from ancient product recommender systems within the following aspects: 1) breed was developed supported a microblogging service platform. As such, it's not restricted by the knowledge obtainable in any

specific e-commerce web site. Additionally, breed is in a position to trace users' purchase intents in close to time period and build recommendations consequently. 2) In breed, product recommendation is framed as a learning to rank drawback. Users' characteristics extracted from their public profiles in microblogs and products' demographics learned from each on-line product reviews and microblogs square measure fed into learning to rank algorithms for product recommendation.

III. MICROBLOGGING SERVICES

In this section we introduce our target social network Twitter. Users in the micro blogger Twitter can publish short posts in 140 character limit so-called tweets. Today, Twitter users can generate more than 300 Million tweets each day [2] about different topic and interest. For example, people can generate brief posts about their personal experience in reading books, watching movies, breaking news or even the release of new electronic gadgets as shown in Fig.1. In addition, users have the choice to establish relationships among each others for social links, seeking information or identifying following/followers friends.

Fig.1. Example of user's friends intercommunications in OSNs.

Measuring the different level of hidden and subjective trust relationships between friends in Twitter is crucial in our research. Therefore, we developed a tool to automatically collect social network data by using Twitter API. This tool extracts the required interactions between friends, and it is called Twitter Interaction Extractor (TIE).

IV. CONCLUSION

In this paper, we have studied a novel problem, cross-site cold-start product recommendation, i.e., recommending products from e-commerce websites to micro blogging users without historical purchase records. Our main idea is that on the e-commerce websites, users and products can be represented in the same latent feature space through feature learning with the recurrent neural networks. Using a set of linked users across both e-commerce websites and social networking sites as a bridge, we can learn feature mapping functions using a modified gradient boosting trees method, which maps users' attributes extracted from social networking sites onto feature representations learned from e-commerce websites. The mapped user features can be effectively incorporated into a feature-based matrix factorization approach for cold start product recommendation. We have constructed a large dataset from WEIBO and JINGDONG. The results show that our proposed framework is indeed effective in addressing the cross-site cold-start product recommendation problem. We believe that our study will have profound impact on both research and industry communities. Currently, only a simple neutral network architecture has been employed for user and product embeddings learning. In the future, more advanced deep learning models such as Convolution Neural Networks13 can be explored for feature learning. We will also consider improving the current feature mapping method through ideas in transferring learning [3].

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