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TACKLING THE COLD START PROBLEM IN RECOMMENDER SYSTEMS USING DATA MINING

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Abstract

Recommender Systems (RSs) are software tools and techniques providing suggestions for items to be of use to a user. People often use recommender systems to make decision. Based on recommendations by other individuals or authorities, choices can be made even without adequate first-hand knowledge of the alternatives. In everyday life, we rely on recommendations from other people either by word of mouth; recommendation letters, movie and book reviews printed in newspapers, or general surveys etc.

Recommender systems are tools for interacting with large and complex information spaces. They provide a personalized view of such spaces, prioritizing items likely to be of interest to the user. The field, christened in 1995, has grown enormously in the variety of problems addressed and techniques employed, as well as in its practical applications. Recommender systems research has incorporated a wide variety of artificial intelligence techniques including machine learning, data mining, user modelling, case-based reasoning, and constraint satisfaction, among others. Personalized recommendations are an important part of many online e-commerce applications such as Amazon.com, Netflix, and Pandora.

Various personal services in business play important roles in the success of current marketing field. The personalized recommendation technique in recommender systems, one of the most important tools of personal service in websites, makes great significance in Internet marketing activities of e-Commerce. This wealth of practical application experience has provided inspiration to researchers to extend the reach of recommender systems into new and challenging areas.

Keywords: *E-Commerce, Recommender System,Cold Start, Cross-Site Cold-Start Product Recommendation.*

INTRODUCTION

In this project, I 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, I 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. I believe that our study will have profound impact on both research and industry communities. Currently, only simple neutral network architecture has been employed for user and product embedding's learning.

EXISTING SYSTEM

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. There has also been a large body of research work focusing specifically on the cold-start recommendation problem:
(a) Serouss iet al. proposed to make use of the information from users 'public profiles and topics extracted from user generated content into a matrix factorization model for new users 'rating prediction.
(b) Zhang et al. propose a semi-supervised ensemble-learning algorithm.
(c) Schein proposed a method by combining content and collaborative data under a single probabilistic framework.
(d) Lin et al. addressed the cold-start problem for App recommendation by using the social information.

DISADVANTAGES

1. They only focus on brand or category-level purchase preference based on a trained classifier, which cannot be directly applied to our cross-site cold start product recommendation task.
2. Their features only include gender, age and Facebook likes, as opposed to a wide range of features explored in our approach.
3. They do not consider how to transfer heterogeneous information from social media websites into a form that is ready for use on the e-commerce side, which is the key to address the cross-site cold-start recommendation problem.

Proposed System

- In this paper, we study an interesting problem of recommending 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 recommendation.
- 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 challenge, we propose 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, I propose learning both users' and products' feature representations (called user embedding and product embedding, respectively) from data collected from e-commerce

websites using recurrent neural networks and then apply a modified gradient boosting trees method to transform users' social networking features into user embedding.

- I then develop a feature-based matrix factorization approach which can leverage the learnt user embedding for cold start product recommendation.

ADVANTAGES

1. Our proposed framework is indeed effective in addressing the cross-site cold-start product recommendation problem.
2. I believe that our study will have profound impact on both research and industry communities.
3. I formulate a novel problem of recommending products from an e-commerce website to social networking users in "cold-start" situations.
4. To the best of our knowledge, it has been rarely studied before.
5. I 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.
6. I propose a modified gradient boosting trees method to transform users' micro blogging attributes to latent feature representation, which can be easily incorporated for product recommendation.
7. I propose and instantiate a feature-based matrix factorization approach by incorporating user and product features for cold-start product recommendation.

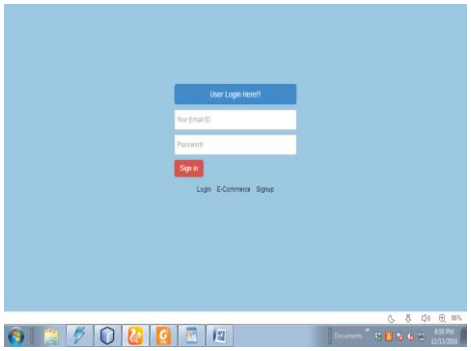

Figure 1: Login Screen

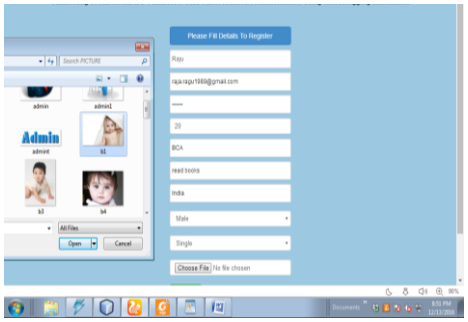

Figure 2: Register

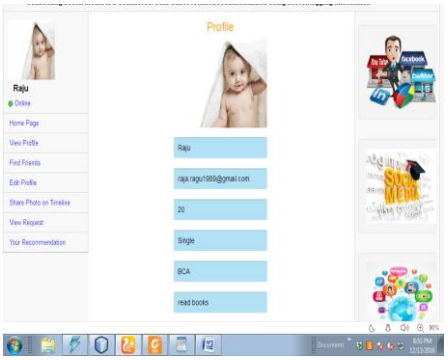

Figure 3: Home Screen

RESULTS AND OUTPUTS

CONCLUSION

In this project, I 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, I 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. I 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 embedding's learning. In the future, more advanced deep learning models such as Convolutional Neural Networks13 can be explored for feature learning. I will also consider improving the current feature mapping method through ideas in transferring learning.

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