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Linking E-Commerce to Social Networks for Product Recommendation

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Abstract*: *From past many years to now-a-days we are seeing e-commerce and social networking sites have gradually blurred. Normally, while we are seeing products in social networking sites and we have to buy them, and then we have to transfer to e-commerce sites. That process is cross-site. But, by using our project we need not to transfer to other sites. We can buy the products in social networking sites itself. But while buying products in social networking sites, we have a problem that is "cross-site cold start product recommendation problem". That is without having historical purchase records. By using our project, we provide a user reviews. By those user reviews we can get new recommendations. In this project we are presenting a novel solution to cross-site and cold start problems. Cold-start means a user who does not have any historical purchase record.
Keywords*: *Cross site, cold start, product recommendation, user embedding features, product embedding features.

I. INTRODUCTION

In recent years the boundaries between social networking sites and e-commerce has almost been vanished. With a social networking id one can log onto many e-commerce sites. The e-commerce sites to promote their products are using the social networking sites as a medium. These products posted as posts in social networking sites so far as studied get deviated to the e-commerce sites where the user can buy their product. This deviation from one site to another is called is the "cross-site". In so far studies the concept of avoiding cross-site and recommending product in other site has not been explored.

In this paper, we are presenting a novel solution to cross-site and cold start problems. Cold-start means a user who does not have any historical purchase record. To recommend a product to users we are presenting a novel solution. To do this we are using linked users (users who have both social networking registered and e-commerce registered) and also the micro blogging attributes of users. By using this, the data of user is safe within the application and there is no data theft which might happen in the case of cross-site situation. Also by using this application we can also recommend a product according to person likes and tastes even in cold-start situations.

To recommend product to user who does not have any historical purchase record it uses the neural networks and predicts the product according to user social networking profile. It also takes into account the geographical features of the user to make predictions more accurate. In the previous studies to recommend a product in cold start situations an initial interview process is conducted to analyse the user taste. But in our project it uses the available data and user's social networking profile along with the information gathered by the linked users. The main task lies in translation of the user's social features into latent information for the mining process.

II. BACKGROUND WORK

Many e-commerce sites are there in the recent days and their main problem comes how to market their products apart from their own site and do recommendations to the customer. If they do recommendations to the customer will they believe the opinion? Questions have risen in product recommendation. Many algorithms have been designed to recommend product in cold start situation also using matrix factorization technique [3], functional matrix factorization [4], gradient boosting algorithms [5], and so on. But all the algorithms so far proposed have not been included in the user's social networking profile or have conducted any initial interview process to know about user. A Cross-site cold start problem has so far not been explored in the bright side. The major e-commerce site like amazon [2] have designed a new algorithm to deal with its huge number of products but recommending a product to a cold start user is not explored by leading site also. So in this paper we are trying to propose a new way to recommend a product to a user who has no previous purchase history. The friends of user in social network can also recommend product to him and he can also rank it based on its description or usage etc...

III. EXISTING SYSTEM

In beginning years, the boundaries surrounded by e-commerce and social networking have begun increasingly blurred. E-commerce

websites such as eBay features has large amount of the characteristics of social networks, including real-time status updates and interactions surrounded by its buyers and sellers. Some e-commerce websites also support the mechanism of social login, which allows classy users to notarize in with their actual login information from social networking services such as Facebook, Twitter or Google. Both Facebook and Twitter have approved a new feature last year that manage users to buy products directly from their websites by clicking a "buy" button to purchase items in adverts or distinct posts. With the new trend of conducting e-commerce activities on social networking sites, it is consistent to leverage knowledge extracted from social networking sites for the development of product recommender systems.

IV. PROPOSED WORK

So far, cold start product recommendation problem in cross site situations has not been explored before. Now we propose a novel solution for this problem.

A. Product Recommendation Module

The lively problem of recommending products from e-commerce websites to users at social networking sites who do not have historical product records, i.e., in "cold-start" situations. We called this problem as cross-site cold-start product recommendation. Although online product recommendations has been generally studied earlier most studies only meet on constructing solutions within actual e-commerce websites and mainly manipulate users historical trading records. To evaluate the linked users across social networking sites and e-commerce websites (users who have social networking accounts and have obligated purchases on e-commerce websites) as a bridge to map users social networking features to implicit features for product recommendation. In resolute, we illustrate learning both users and products features representations (user and product embedding's) from information collected from e-commerce websites using recurrent neural networks and already apply a modified gradient boosting trees approach to standardize users networking features into user embedding's. We earlier develop a feature based matrix factorization approach which can leverage the learnt user embedding's for cold start product recommendation.

B. Product Embedding Module

Given a exist of symbol sequences, a fixed-length vector representation for each symbol can be learned in a latent space by exploiting the context data among symbols, anywhere "similar" symbols will be mapped to nearby positions. If we treat each output ID as a word token, and convert the classified purchase records of a user into a timestamped sequence, we can then consider the uniform methods to get product embedding's. Unlike matrix factorization, the decision of historical purchases from a user can be accordingly captured.

C. User Embedding Module

The user embedding's in a similar way, earlier we can explore the correlated representations of a user and products for product recommendation. The buy history of a user can be expected as a "sentence" consisting of a mix of product IDs as word tokens. A user ID is controlling at the different of each sentence, and both user IDs and product IDs are treated as word tokens in a vocabulary in the studying process. The user embedding representation for each user ID reflects the users for the personalized buy preference; secondly the surrounding framework, i.e., output purchases, is used to capture the shared purchase patterns bounded by users. Compared to the constant matrix factorization, the (window-based) sequential framework is additionally modelled in addition to user preference, which is about to be to potentially yield better recommendation results.

D. Heterogeneous Mapping Representation Module

To constitute a microblogging feature vector au from a microblogging website and learn or to find distributed representation vu from an e-commerce website respectively. In the cross-site cold-start product recommendation problem we expected in this project (i.e., make a product recommendation to a user u who has never purchased complete products from an ecommerce website), we can only receive the microblogging feature vector au for user u. The key subject is to manage a thick number of linked users across sites as a bridge to get a function which maps the original feature representation au to the distributed representation vu. Specifically, we can comprise a training set consisting of feature vector pairs, {au, vu} u∈UL and cast the feature mapping problem as a direct regression task: the input is a microblogging feature vector au and the product is a distributed feature vector vu.

V. EXPERIMENTAL RESULTS

Performance analysis is a way to measure how far the product designed has met the requirements of the design as stated. To analyse

the performance of our project we have used two simple architectures namely CBOW and Skip-gram. The performance is tested under various methods against both time complexity and space complexity. For each and every method we have calculated the MAP (Mean Average Precision), MRR (Mean Ranking Rate) and AUC (Area under the curve) values. These values are plotted in a graph as shown in the below figure.

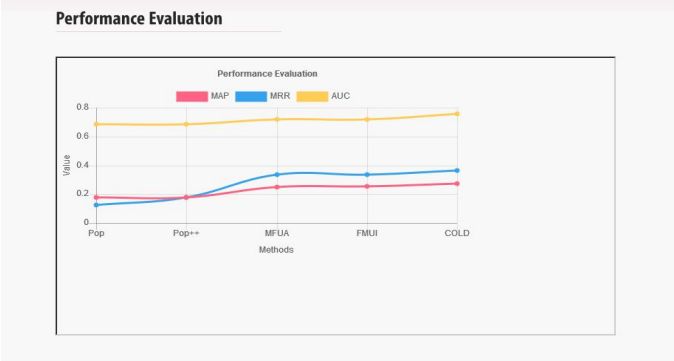

Figure 1: Performance Evaluation

Some of the methods we have tested are

A. Popularity (Pop): In this the products are ranked based on their sale of volumes.

B. Popularity with Semantic Similarity (Pop++): In this method the rank is not general. It is a combination of two scores namely popularity and similarity between product description and user information.

C. MF with User Attributes (MFUA): In this method the user attributes are fitted into the basic matrix factorization algorithm to predict product rating.

D. FM without User interaction (FMUI): Factorization machines are used to follow recommendations. Feature interactions are used to improve SVD feature framework with the microblogging features.

E. Cold: This is our proposed approach which uses the fitted user embedding features and product embedding features.

By all the above methods comparison we can say that our proposed COLD method is very efficient.

VI. CONCLUSIONS

In this project, we have studied a novel problem, cross-site cold-start product recommendation, i.e., recommending products from e-commerce websites to microblogging 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 factorisation approach for cold-start product recommendation.

VII. FUTURE WORK

In this, we have studied the novel solution for "cold-start" product recommendations using simple neural networks architecture for user and product embedding learnings. The results have proven that our proposed framework in effective in addressing the cross-site cold-start product recommendation problem. The future scope of this project can be extended to increase. Learning models such as convolutional neural networks can be explored for feature learning. The current feature mapping techniques used also can be improved through ideas in transferring learning. This project is more effective in recommending product to users who have purchased in another site also apart from the purchased site and also to a new customer who didn't have any purchase records.

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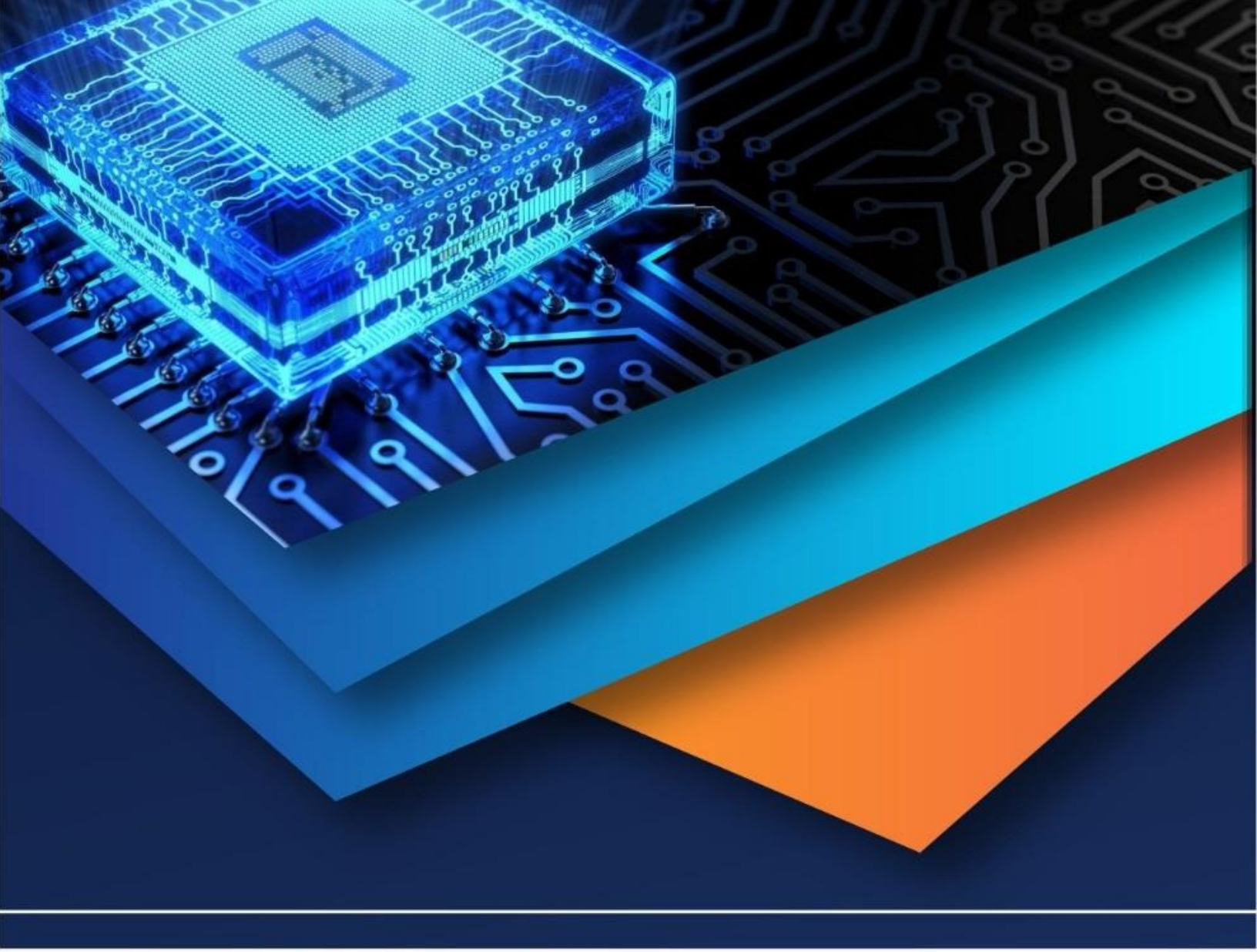

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