Tag recommendation model using feature learning via word embedding

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- Introduction
- Related works
- Proposed Tag recommendation Method
- Experimental results
- Conclusion

INTRODUCTION

Information overload in Web services → Recommender systems are becoming more significant in rapid development of internet

Recommender Systems is used:

- To suggest appropriate choices to users based on intelligent prediction
- To help internet users in easily finding needed information

PROBLEM BACKGROUND

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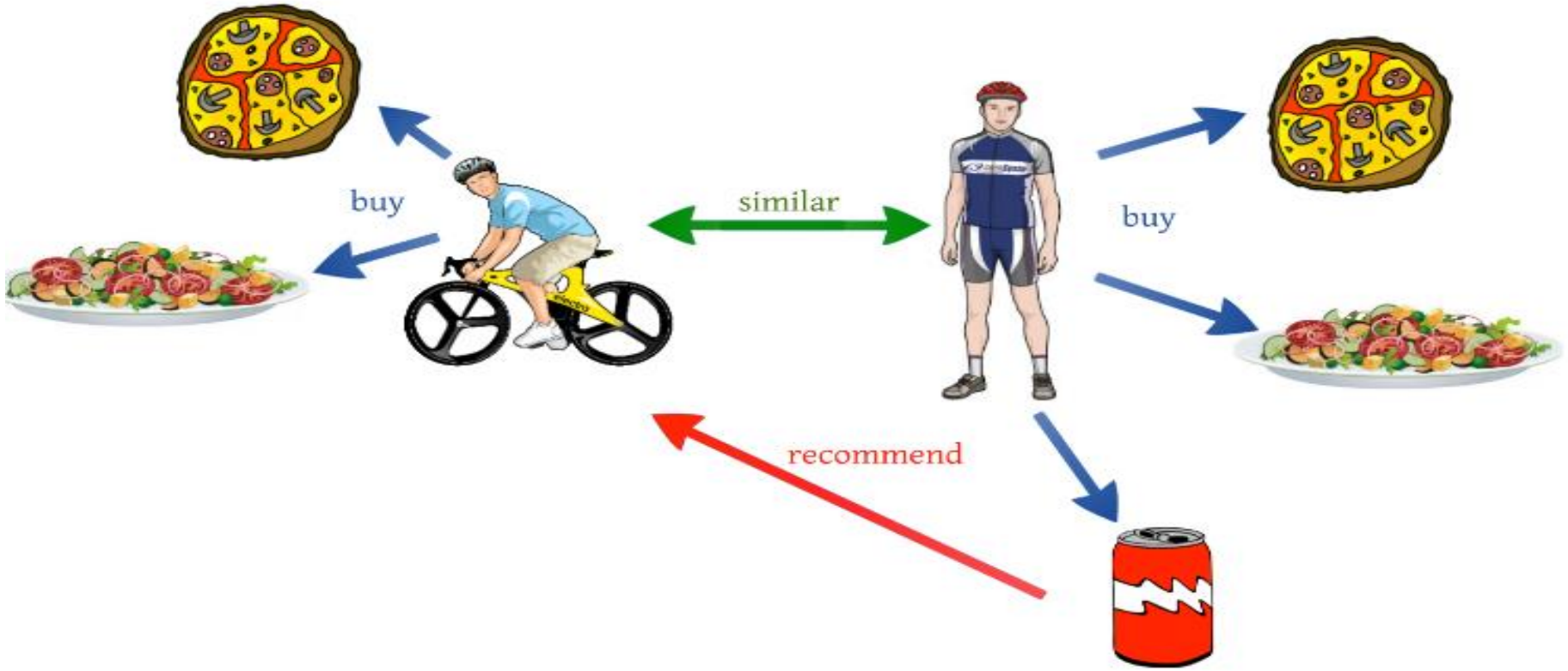
Collaborative Filtering (CF) has been widely used in many commercial systems due to:
its simplistic algorithm and reasonably accurate recommendations.

CF still suffer from data sparsity Problem and cold Strat problem.



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- **The number of ratings obtained is relatively small compared to number of ratings needed for prediction of the vacant ratings therefore sparsity problem occurs. When user ratings on items are very sparse in comparison with the huge number of users and items in user-item matrix, computing neighbor users for active user and making recommendation become incorrect or sometimes impossible.**

- **Cold_start issue in recommendation systems is happen when there is insufficient information for items in system because they are newly added in the system or users have just started to use that new item.**

- In this case, these algorithms are unable to make accurate recommendation because the system has insufficient information on items.

PROBLEM BACKGROUND

Social tags have grown in popularity to organize content corresponds with Web 2.0 applications. In such applications, users can navigate and organize main objects (e.g., images, text or video) with their tags as well as their features for future search and sharing.

- Most tag recommendation methods require to take into account the available initial tag sets in the target object for tag suggesting. However, co-occurrence methods were designed by incorporating the initial tag set and these methods fail in designing co-occurrence information when initial tags are absent. This problem is known cold start problem.

RESEARCH METHODOLOGY

we solve the cold start problem via analyzing various characteristics from multiple sets of word embedding. Our method learns the relation and similarity between words in title or description of objects via random walk.

- We take advantages of idea behind social network embedding to analyze the dependencies between words in a text. It is reasonable to identify good candidate tags for target item or object by measuring the dependency-based features for close words in a sentence.
- We borrow from the logic behind network embedding that nodes within same community have high degree of similarity in compare to nodes belonging to different communities.

- Our method uses the Skip-gram model to provide effective information or features for learning representation vector of words in textual structure.
- Subsequently, we employ stochastic gradient descent to optimize the learning representation vector of words.
- We evaluate our method on real dataset, namely, Movielens dataset and compare result with previous research methods.

Proposed Tag recommendation Method

We present our tag recommendation algorithm by considering the logic behind network community to create latent feature (not hand-crafted features) about words inside descriptions available for target object. Therefore, our algorithm embed matrix structure alongside potential features into the learned representation vectors of words.

- In our method, dependency feature structure for each word is extracted using random walk strategy.
- Then, Skip-gram model is used to learn the representation of feature word vectors from these generated random walks.
- Using this way, we are finding the neighborhood structure of a word that is presented by order proximities of other words in a text.
- The matrix was randomly generated to start the representation of word-features vector.
- Subsequently, we ranking the candidate tags that extracted from similar objects (words) based their similar features.
- Consider that, each word in a sentence is known as a candidate tag but words are used for tag recommendation that have a much higher chance based on their features.

Proposed Tag recommendation Method

Skip-gram is a language model which makes the most of conditional probability of occurrences of words in a predefined window w as illustrated in Eq. (1).

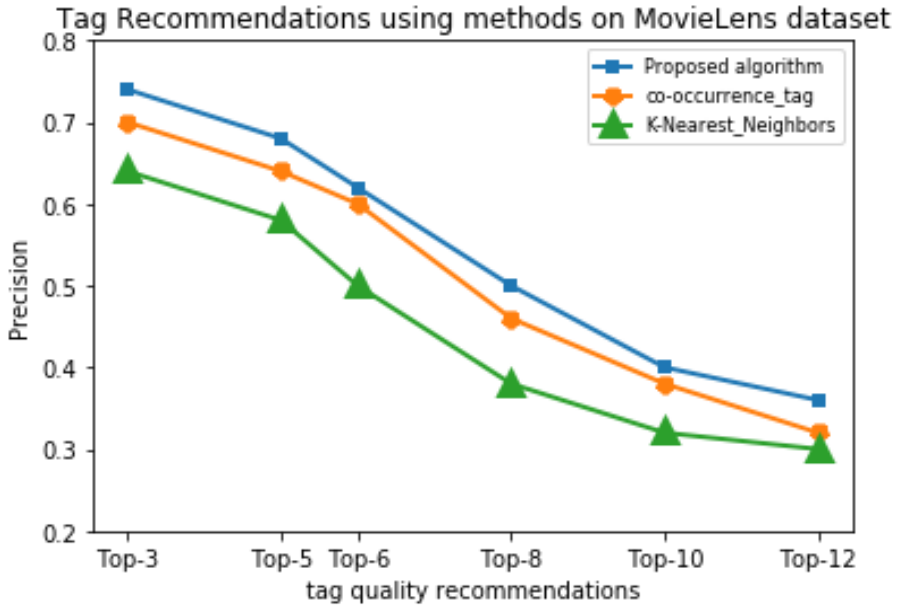
$$\Pr(w \mid f(u)) = \max_{f} \prod_{j=i-w}^{i+W} Pr\left(v_j \mid f(u)\right) \qquad (1)$$

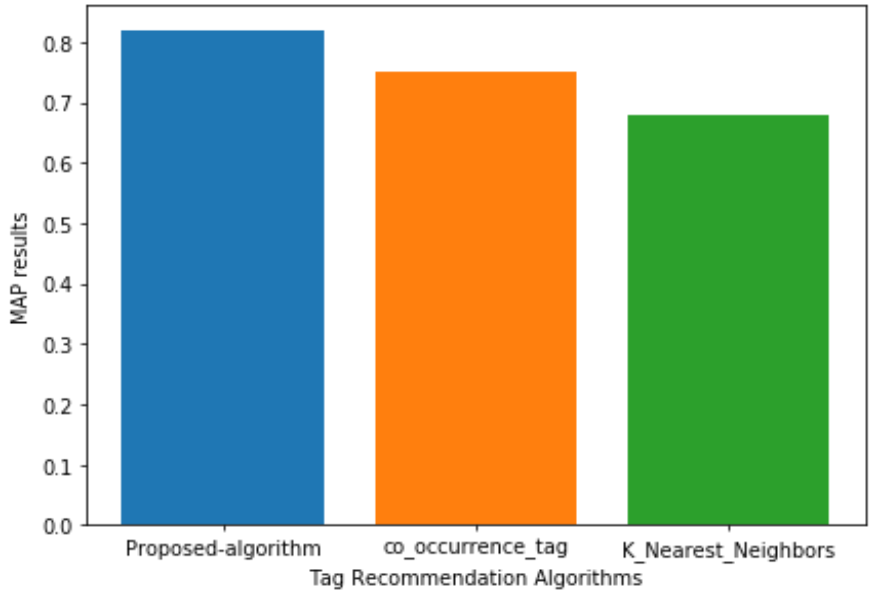
Softmax function has been employed to estimate the probability distribution of Eq. (1) as shown in Eq. (2):

$$\Pr(v_j \mid f(u)) = 1/(1 + e^{-f(u).f(v_j)}) \qquad (2)$$

COMPARATIVE EVALUATION

Our method was compared with two other tag recommendation algorithms. Precision and Mean Average Precision were used for evaluation and results showed the improvements to previous research methods





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