

Entropy-based Ranking Approach for Enhancing Diversity in Tag-based Community Recommendation

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Abstract

Accuracy is the dominant performance evaluation in recommender systems. However, user satisfaction in recommendation includes other factors such diversity and novelty. Some solutions for improving diversity in recommendation, use re-ranking as a post-process on recommendation list achieved from accuracy-aware algorithms. In this work, we propose a method to involve entropy of communities as a diversity factor into the predicted weights from HOSVD method, helping to improve diversity in recommendation list without re-ranking. Experiments on Last.FM dataset, for the case of community recommendation with multi-mode data including users and tags for each community, proves the benefit on introducing diversity factor into the accuracy-based recommendation solutions to improve diversity.

Keywords: Diversity, Recommender Systems, Entropy, Community Recommendation, HOSVD, Multi-Mode data

1. Introduction

Accuracy measurement is the main goal of most of the recommender system evaluation metrics. However, these evaluation metrics operate on narrow of whole collection of data. In the other words, they only evaluate the proportion of items which user has interacted with, and forsake the rest of items. The current evaluation metrics are unable to involve the diversity and coverage of recommended items.

Recommender systems refer to diversity as “how accumulate dissimilarity are between pairs of items in a recommendation list for specific user (intra-list diversity), between two recommendation lists for different users (inter diversity), or whole recommendations of system (aggregate diversity)” (Adomavicius and Kwon, 2012). Whereas novelty of an item is defined as “how different it is with previously seen/known items” (Castells et al., 2011).

In addition to the diversity, there are other concepts of recommendation quality which are in contrast with the accuracy. One of the most obvious questions about RS quality is whether its recommendations can satisfy users’ information needs (Herlocker et al., 2004).

Quality, as a concept of measuring, has been discussed and different definitions have released. While the main goal of recommender systems is minimizing the prediction error, redundancy and obviousness as the most shortcomings of current accuracy-aware solutions are not considered. In recommendation context, diversity and novelty are mostly discussed as quality measures (Ge et al., 2010).

2. Previous Works

Recommendation quality of a recommender system is defined as “How many correct recommendations it can generate.” However, correct recommendation is a broad concept and need to be investigated.

According to (Cao et al., 2012), there are some reasons to consider factors in addition to accuracy into consideration; humans tend to like variety, discovery, and change, hence pure accuracy oriented solutions may result a boring and ineffective recommendation list. Moreover, over-personalization based on past preferences harms user’s growth and experience. However, it needs to balance the conflict between accuracy and non-accuracy factors like diversity, novelty and serendipity.

Auray and Nationale (2007) propose using folksonomy for the recommendation approaches with attention to discovery (relevant items which user wouldn’t have found by himself). An intuitive representation of novelty and serendipity in recommendation is mentioned in (Vargas and Castells, 2011) by dividing the related items into three categories for user, including seen, chosen, and relevant items.

Diversity in a set of items is related to how different the items are, comparing with the others. In a specific set of items, when item set is diverse, each item tends to be novel comparing to the rest of the items. When talking about diversity, individual diversity refers to the difference between items in a recommendation for an specific user, and aggregate diversity refers to the total ratio of different