Opinionated Explanations of Recommendations from Product Reviews

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1   Introduction

Recommender systems are now mainstream and people are increasingly relying on them to make decisions in situations where there are too many options to choose from. Yet many recommender systems act like "black boxes", providing little or no transparency into the rationale of their recommendation process [1]. Related research in the field of recommender systems has focused on developing and evaluating new algorithms that provide more accurate recommendations. However, the most accurate recommender systems may not necessarily be those that provide the most useful recommendations — due to the influence of how recommendations are presented and justified to users [2–4]. Therefore, recommender systems must be able to explain what they do and justify their actions in terms that are understandable to the user. An explanation, in this context, is any added information presented with recommendations to help users better understand why and how a recommendation is made [5]. Studies show that explanations help users make better decisions and are therefore provided for many reasons [6, 7], which normally align with the objective of the recommender system. Interestingly, explanations may sometimes be provided from the users (not from the recommender system) to justify their choices [8].

The availability of user-generated reviews that contain real experiences provides a new opportunity for recommender systems; yet, existing methods for explaining recommendations hardly take into account the implicit opinions that people express in such reviews even though studies show that users are increasingly relying on the reviews to make better choices [9]. Also, explanations usually provide a posthoc rationalisation for recommendations; but, this work is motivated by a more intimate connection between recommendations and explanations, which poses the question: *can the recommendation process itself be guided by structures generated to explain recommendations to users?*

This work builds on existing research in the areas of case-based reasoning, recommender systems and opinion mining to propose a novel approach for building explanations in recommender systems. We will also explore the potential of opinionated explanations in driving the recommendation process.

2 Research Plan

The core focus of this work is to explore the role of opinions in explaining recommendations. Accordingly, we have identified the following areas of interest:

Ranking, filtering and evaluating feature quality. Feature-level opinion mining algorithms that are capable of extracting very granular opinions, such as [10], yield noisy features because they rely on shallow natural language processing (NLP) techniques. Ultimately, these features lack context and are too fine-grained to be intuitive to users. For instance, it will be nonsensical to explain a hotel recommendation as *"because visitors liked the wire..."*, where *'wire'* is a feature mined from reviews. Hence, the research question: *"how to rank, filter and evaluate features mined from reviews"*. We will use off-the-shelf opinion mining techniques but focus on developing methods for ranking features so that they can be filtered and evaluated for quality (i.e. the extent to which a feature is relevant and presentable to users in explanations). This involves creating new methods for summarising features so that only qualitative and comprehensible features are presented in explanations.

Generating opinionated explanations. Explanations normally demonstrate how one or more recommended items relate to a user's preferences, normally through an intermediary entity such as a user, item, or feature. For instance, Netflix may use the movies that a user has rated highly in the past to explain a movie recommendation. And since user ratings are often unable to fully represent user preferences, there is a place of fine-grained opinions that are explicitly provided by users in textual reviews. We expect that explanations that are based on opinionated reviews will be more natural and convincing. Hence the research question: *how to use such opinions to generate explanations of product recommendations?*. We will use opinions from reviews to generate that justify a particular recommendation or sets of recommendations, and we will conduct live-user trials to test for its usefulness in decision-making.

Driving recommendations using explanations. To date, most recommender systems have treated explanations as an afterthought, presenting them alongside recommendations, but with little connection to the recommendation process itself. This work will explore the potential of using explanations to drive the recommendation process itself so that, for example, an item will be recommended because it can be explained in a compelling way. Hence the research question: *how to use explanations to support similarity metrics and ranking strategies in a recommendation process?*

3 Progress

To address the problem of feature quality, we used the approach in [10] to mine opinions from a dataset of TripAdvisor hotel reviews. Then, using various lexical and frequency-based filtering techniques, we removed noisy, less opinionated and unpopular features. The remaining features were summarised into higher-level representations by clustering them based on the words they co-occur with in

sentences of reviews. This feature representation allows us to replace a low-level feature (e.g. 'orange juice') with a more meaningful higher-level one (e.g. 'breakfast') that is suitable for use in explanations.

We developed a new method for generating personalized explanations which highlight the pros and cons of a recommended item to a user. Our approach focuses on the features that the user has mentioned in their reviews, and those mentioned about the recommended item by other users. In the explanation, we prioritize the features that are likely to be of interest to the user. Each feature is classified as a pro or con based on its sentiment, and it is ranked by its popularity with the user and the recommended item.

We also developed another explanation strategy that explains a recommended item in comparison with other recommendations. That is, the explanation presents features of the recommended item that are better or worse than its alternatives.

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