Review Explorer: An Innovative Interface for Displaying and Collecting Categorized Review Information
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ABSTRACT
Review Explorer is an interface that utilizes categorized information to help users to explore a huge amount of online reviews more easily. It allows users to sort entities (e.g. restaurants, products) based on their ratings of different aspects (e.g. food for restaurants) and highlight sentences that are related to the selected aspect. Existing interfaces that summarize the aspect information in reviews suffer from the erroneous predictions made by the systems. To solve this problem, Review Explorer performs a real-time aspect sentiment analysis when a reviewer is composing a review and provides an interface for the reviewer to easily correct the errors. This novel design motivates reviewers to provide corrected aspect sentiment labels, which enables our system to provide more accurate information than existing interfaces.

Author Keywords
Human computation; sentiment analysis

ACM Classification Keywords
H.5.2 [Information interfaces and presentation]: User Interfaces.

INTRODUCTION
Online reviews contain valuable information for consumers to compare different entities (e.g. restaurants, products) to make wiser decisions [2].

Although there are many existing systems that summarize online reviews, a common challenge is how to automatically summarize and highlight different aspects (e.g. food for restaurants) of online reviews for different entities so that users can focus on only relevant information [3]. The current interface (Review Explorer) focuses on two major features. First, when reading reviews, users of Review Explorer can highlight sentences that are related to the aspect which interests them. Second, when composing reviews, reviewers can correct the erroneous predictions made by the system because the analysis behind the system is done in nearly real time.

When users browse entities described by the reviews using Review Explorer, they can sort entities by their ratings of different aspects (Figure 1). Because aspect ratings can match the preferences of users, they are more useful than the overall ratings. For example, when epicureans search for restaurants, sorting restaurants based on food ratings instead of overall ratings can let them find the restaurants they like more easily. In addition, when users of Review Explorer read the reviews of a specific entity, they can highlight sentences that are related to the selected aspect (Figure 2). This allows users to focus on the information that interests them, which greatly reduces the information that needs to be processed by them. For example, when users want to learn more about the service of
some particular restaurants using Review Explorer, they can choose to highlight sentences that are related to service. Then all the sentences that are not related to service will be filtered out. This can save them much time and effort especially when the amount of reviews is huge.

Moreover, in order to provide more accurate information to users, when reviewers compose new reviews using Review Explorer, the system provides them an interface that shows real-time predictions of categorized information for them to verify. For instance, if a reviewer is writing a sentence about the food quality of a restaurant but the system mistakenly classifies it as a sentence about the service. The reviewer can simply click an icon on the interface to correct this error. This novel design can reduce many mistakes made by the system and allow it to provide more accurate information than existing interfaces with similar purpose.

The preliminary study shows that the users of Review Explorer can gather meaningful information from a large amount of reviews in a much shorter time than those who read reviews on traditional interfaces.

SYSTEM DESIGN AND IMPLEMENTATION
The aspect sentiment classifiers of the system were built with crowdsourcing on Amazon Mechanical Turk\(^1\) and SVM\(^{\text{light}}\) package\(^2\). This allows us to implement the system in a cost-effective way.

Data and aspects of the current system
The data used in the current system is retrieved from Yelp’s Academic Dataset\(^3\), which consists of 87,173 reviews about the restaurants near 30 schools. In this preliminary study, we used three predefined aspects: food, service, and price. However, the data and aspects of the system can be easily altered or expanded and are not limited to the current settings.

Two-layer aspect sentiment analysis
To find the information needed for Review Explorer, a two-layer aspect sentiment analysis is conducted on each review in the corpus. The first layer of the analysis is the sentence aspect classification. In this layer of analysis, the system decides if one sentence is related to a target aspect or not. To construct the classifiers, we collected 5,000 labeled sentences by recruiting 194 workers from Amazon Mechanical Turk at a cost of $9.70 (from 4/11/2012 to 4/21/2012). The workers were asked to label whether a sentence is related to food, service, price, or none of them. The labeled sentences then were used as the training instances for the classifiers that classify the aspects of other sentences in the corpus. The classifiers were constructed using SVM\(^{\text{light}}\) package. The second layer of the analysis is the aspect rating prediction, which predicts the star ratings of different aspects in each review. The system utilizes the results of the first layer analysis to separate reviews into parts that are related to different aspects. Then the ratings of each aspect are inferred by using only the related part of the review. Therefore, if a review has more positive (negative) words to describe a particular aspect, the system could give the aspect a higher (lower) rating based on the words used to describe the aspect.

Collecting corrected labels from reviewers
Existing interfaces that summarize the aspect information in the reviews such as Review Spotlight [4] and Opinion Observer [1] suffer from the errors made by the sentiment analysis behind the systems [4]. To solve this problem, Review Explorer has an innovative interface that performs real-time two-layer aspect sentiment analysis when a reviewer is composing a review. Whenever the reviewer finishes a sentence of the review, the web-based system will send it to the server using AJAX. When the server receives the sentence written by the reviewer, a Python script will convert the text of the sentence into a feature vector that can be processed by the classifiers. Then the system will conduct the two-layer classification using SVM\(^{\text{light}}\) package. Finally, the result of the analysis will be sent back to the interface at the client side. The whole analysis can be done within one second including the latency of the Internet, so it feels like the analysis is done in real time for the reviewers. If the analysis is wrong, the reviewers can simply click the icons on the interface to correct it. Therefore, the aspect sentiment labels generated by Review Explorer are verified and corrected by reviewers. These accurate labels can be directly used to help other users to understand reviews. They are also included as new training instances for the classifiers, which makes the system generate more accurate predictions in the future.

REFERENCES