

Extracting Product Features and Opinions from Reviews

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2.1 Introduction

The Web contains a wealth of opinions about products, politicians, and more, which are expressed in newsgroup posts, review sites, and elsewhere. As a result, the problem of “opinion mining” has seen increasing attention over the past three years from [1, 2] and many others. This chapter focuses on product reviews, though we plan to extend our methods to a broader range of texts and opinions.

Product reviews on Web sites such as `amazon.com` and elsewhere often associate meta-data with each review, indicating how positive (or negative) it is using a 5-star scale, and also rank products by how they fare in the reviews at the site. However, the reader’s taste may differ from the reviewers’. For example, the reader may feel strongly about the quality of the gym in a hotel, whereas many reviewers may focus on other aspects of the hotel, such as the decor or the location. Thus, the reader is forced to wade through a large number of reviews looking for information about particular features of interest.

We decompose the problem of review mining into the following main sub-tasks:

I. Identify product features. In a given review, features can be *explicit* (e.g., “the *size* is too big”) or *implicit* (e.g., “the scanner is slow” refers to the “scanner speed”).

II. Identify opinions regarding product features. For example, “the size is *too big*” contains the opinion phrase “*too big*,” which corresponds to the “size” feature.

III. Determine the polarity of opinions. Opinions can be *positive* (e.g., “this scanner is *so great*”) or *negative* (e.g., “this scanner is a *complete disappointment*”).

IV. Rank opinions based on their strength. For example, “*horrible*” is a stronger indictment than “*bad*.”

This chapter introduces OPINE, an unsupervised information extraction system that embodies a solution to each of the above subtasks. Given a particular product and a corresponding set of reviews, OPINE outputs a set of *product features*, accompanied by a list of associated *opinions*, which are ranked based on strength.

Our contributions are as follows:

1. We describe OPINE’s novel use of a *relaxation labeling* method to find the semantic orientation of words in the context of given product features and sentences.
2. We compare OPINE with the review mining system of Hu and Liu [2] and find that OPINE’s precision on the *feature extraction* task is 22% higher than that of Hu and Liu, although its recall is 3% lower. We show that 1/3 of OPINE’s increase in precision comes from the use of its *feature assessment* mechanism on review data while the rest is due to Web statistics.
3. While many other systems have used extracted opinion phrases in order to determine the polarity of sentences or documents, OPINE reports its precision and recall on the tasks of *opinion phrase extraction* and *opinion phrase polarity extraction* in the context of known product features and sentences. On the first task, OPINE has a precision of 79% and a recall of 76%. On the second task, OPINE has a precision of 86% and a recall of 89%.
4. Finally, OPINE ranks the opinion phrases corresponding to a particular property based on their strength and obtains an accuracy of 73%.

The remainder of this chapter is organized as follows: Section 2.2 introduces the basic terminology; Section 2.3 gives an overview of OPINE, and describes and evaluates its main components; Section 2.4 describes related work; and Section 2.5 describes our conclusions and future work.

2.2 Terminology

A *product class* (e.g., Scanner) is a set of *products* (e.g., Epson1200). OPINE extracts the following types of *product features*: *properties*, *parts*, *features of product parts*, *related concepts*, *parts and properties of related concepts* (see Table 2.1 in subsection 2.3.2 for examples in the Scanner domain). *Related concepts* are concepts relevant to the customers’ experience with the main product (e.g., the company that manufactures a scanner). The relationships between the main product and related concepts are typically expressed as verbs (e.g., “the company *manufactures* scanners”) or prepositions (“scanners *from* Epson”). Features can be *explicit* (“good **scan quality**”) or *implicit* (“good scans” implies good **ScanQuality**).

OPINE also extracts *opinion phrases*, which are adjective, noun, verb or adverb phrases representing customer opinions. Opinions can be *positive* or *negative* and vary in *strength* (e.g., “fantastic” is stronger than “good”).

2.3 OPINE Overview

This section gives an overview of OPINE (see Figure 2.1) and describes its components and their experimental evaluation.