A Convolution Kernel Approach to Identifying Comparisons in Text

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Abstract

Comparisons in text, such as in online reviews, serve as useful decision aids. In this paper, we focus on the task of identifying whether a comparison exists between a specific pair of entity mentions in a sentence. This formulation is transformative, as previous work only seeks to determine whether a sentence is comparative, which is presumptuous in the event the sentence mentions multiple entities and is comparing only some, not all, of them. Our approach leverages not only lexical features such as salient words, but also structural features expressing the relationships among words and entity mentions. To model these features seamlessly, we rely on a dependency tree representation, and investigate the applicability of a series of tree kernels. This leads to the development of a new context-sensitive tree kernel: Skip-node Kernel (SNK). We further describe both its exact and approximate computations. Through experiments on real-life datasets, we evaluate the effectiveness of our kernel-based approach for comparison identification, as well as the utility of SNK and its approximations.

1 Introduction

When weighing various alternatives, users increasingly turn to the social media, by scouring online reviews, discussion forums, etc. Our goal is to extract from such corpora those text snippets where users make direct comparisons of entities. While sentiment analysis (Pang and Lee, 2008) may be helpful in evaluating individual entities, comparison by the same author within a sentence provides an unambiguous and more equitable basis for the relative positions of two entities on some aspect. For example, the sentence s_1

in Table 1, taken from an Amazon review about a digital camera, makes two distinct comparisons: #1) between "A630" and "A-series cameras" and #2) between "A630" and "its competition", with a clear sense of which entity mention is the *greater* on some aspect ("larger"). Moreover, comparisons may be objective (e.g., larger) or subjective (e.g., better), while sentiments are primarily subjective.

Problem   Given a sentence and a specific pair of entity mentions, we seek to determine if a comparison exists between those two mentions. In previous work, the problem was formulated as identifying *comparative sentences*, i.e., those containing at least one comparison (Jindal and Liu, 2006a). This is not ideal because a sentence may contain more than two entity mentions, and may be comparing only some of them. For instance, s_1 is comparative with respect to the pair (A630, A-series cameras) and the pair (A630, its competition), but not the pair (A-series cameras, its competition).

We therefore postulate that the more appropriate formulation is *comparisons within sentences*. If a sentence compares two entities (A, B) with respect to some aspect Z, it should be possible to reformulate it into another sentence such as: "A is better than B with respect to Z" (Kessler and Kuhn, 2014a). Based on this definition, there is no comparison between (A-series cameras, its competition) in s_1. Here, we adopt this apt definition with a slight restriction to make it more practical, and seek to identify such comparisons automatically. We consider only sentences with at least two entity mentions involved in gradable comparisons, i.e., a clear sense of scaling in the comparison (e.g., A is better than B.). Such comparisons are more useful in investigating the pros and cons of entities, as opposed to equative comparisons expressing parity between two mentions (e.g., A is as good as B.), or superlative comparisons expressing the primacy of an entity with respect to unknown reference entities (e.g., A is the best.).

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