Event-based Multi-document Summarization

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Abstract

Daily amount of news reporting real-world events is growing exponentially. At the same time, Organizations are looking for information about current and past events that affect them, such as mergers and acquisitions of companies. The Organizations need to obtain event information in a fast and summarized form to make decisions. Event-based retrieval and summarization systems offer an efficient solution to this problem. Most summarization research work uses news stories. Although this type of documents is characterized by conveying information about events, almost all work concentrates on approaches that do not take into account this aspect.

The proposed multi-document summarization methods are based on the hierarchical combination of single-document summaries. We improved our multi-document summarization methods using event information. Our approach is based on a two-stage single-document method that extracts a collection of key phrases, which are then used in a centrality-as-relevance passage retrieval model. To adapt centrality-as-relevance single-document summarization for multi-document summarization that is able to use event information, we needed a good and adaptable baseline system. Because the key phrase extraction play a significant role in the summarization, we improved a state-of-the-art key phrase extraction toolkit using four additional sets of semantic features. The event detection method is based on Fuzzy Fingerprints, which is a supervised method trained on documents with annotated event tags. We explored three different ways to integrate event information, achieving state-of-the-art results in both single and multi-document summarization using filtering and event-based features. To cope with the possible usage of different terms to describe the same event, we explored distributed representations of text in the form of word embeddings, which contributed to improve the multi-document summarization results.

The automatic evaluation and user study performed show that these methods improve upon current state-of-the-art multi-document summarization systems on two mainstream evaluation datasets, DUC 2007 and TAC 2009. We show a relative improvement in ROUGE-1 scores of 16% for TAC 2009 and of 17% for DUC 2007. We have also obtained improvements in ROUGE-1 upon current state-of-the-art single-document summarization systems of between 32% in clean data and 19% in noisy data. These improvements derived from the inclusion of key phrases and event information. The extraction of key phrases was also refined with additional pre-processing steps and features, which lead to a relative improvement in NDCG scores of 9%. The introduction of Fuzzy Fingerprints for event detection enabled
the detection of all event types, while the best competitor, an SVM with enhanced features, only detects roughly 85% of the different types of events. This lead to a large increase in the G-Mean and variants results when using the Fuzzy Fingerprints method.

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