

From Extractive to Abstractive Summarization: A Journey

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Preface

Research in the field of text summarisation has primarily been dominated by investigations of various sentence extraction techniques with a significant focus towards news articles. In this book, we intend to look beyond generic sentence extraction and instead focus on domain-specific summarisation, methods for creating ensembles of multiple extractive summarisation techniques and using sentence compression as the first step towards abstractive summarisation.

We begin by proposing two new corpora, related to legal and scientific articles, for domain-specific summarisation. The first corpus is a collection of judgements delivered by the Supreme Court of India, with corresponding handwritten summaries written by legal experts. The second dataset is a collection of scientific articles related to the domain of computational linguistics and indexed in the ACL anthology. These two tasks highlight the challenges in domain-specific summarisation. The legal summaries are recall-oriented (trying to retain as much information as possible) and semi-extractive (reuses phrases and sentences from the original document). In comparison, the abstracts of ACL articles are more precision-oriented and abstractive. Both collections have a reasonable number of article-summary pairs, enabling us to use data-driven techniques. We annotate both these corpora through a completely automatic process described without requiring any manual intervention. Excluding newswire corpora, where the summaries are usually article headlines, the proposed collections are among the largest openly available collections for document summarisation. We propose a completely data-driven technique for sentence extraction for legal and scientific articles. In both legal and ACL corpora, the summaries have a predefined format. Hence, it is possible to identify *summary worthy* sentences depending on whether they contain certain key phrases. Our proposed approach uses attention-based neural network to automatically identify these key phrases from pseudo-labelled data, without requiring any annotation or handcrafted rules. The proposed model outperforms the existing baselines and state-of-the-art systems by a large margin.

Next, we explore methods for combining several sentence extraction techniques to build an ensemble. A large number of sentence extraction techniques exist, none of which guarantee better performance than the others. As a part of this book, we

explore whether it is possible to leverage this variance in performance for generating an ensemble of several extractive techniques. In the first model, we study the effect of using multiple sentence similarity scores, ranking algorithms and text representation techniques. We demonstrate that such variations can be used for improving rank aggregation, leading to better sentence rankings. Using several sentence similarity metrics, with any given ranking algorithm, always generates better abstracts. We also propose several content-based aggregation models. Given the variation in performance of extractive techniques across documents, the a priori knowledge about which technique would give the best result for a given document can drastically improve the result. In such case, an oracle ensemble system can be made which chose the best possible summary for a given document. In the proposed content-based aggregation models, we estimate the probability of a summary being good by looking at the amount of content it shares with other candidate summaries. We present a hypothesis that a good summary will necessarily share more information with another good summary, but not with a bad summary. We build upon this argument to construct several content-based aggregation techniques, achieving a substantial improvement in the ROUGE scores.

In the end, we propose another attention-based neural model for sentence compression. We use a novel context encoder, which helps the network to handle rare but informative terms better. We contrast our work to some sentence compression and abstractive techniques that have been proposed in the past few years. We present our arguments for and against these techniques and build a further road map for abstractive summarisation. In the end, we present the results on an end-to-end system which performs sentence extraction using stand-alone summarisation systems as well as their ensembles and then uses the sentence compression technique for generating the final abstractive summary. Overall, this book is aimed at providing alternates to generic extractive summarisation in the form of domain-specific as well as ensemble techniques, gradually leading to sentence compression and abstractive summarisation.

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