JAIST Repository
https://dspace.jaist.ac.jp/

Title	A Study of Reinforcement Learning for Abstractive Summarization
Author(s)	Le Thanh Tung
Citation	
Issue Date	2018-09
Type	Thesis or Dissertation
Text version	author
URL	http://hdl.handle.net/10119/18799
Rights	
Description	Supervisor: NGUYEN, Minh Le, 先端科学技術研究科, 修士(情報科学)

JAIST
JAPAN
ADVANCED INSTITUTE OF
SCIENCE AND TECHNOLOGY

Japan Advanced Institute of Science and Technology

A Study of Reinforcement Learning for Abstractive Summarization

LE Thanh Tung (1610438)

School of Information Science, JAIST, lttung@jaist.ac.jp

Extended Abstract

In the explosion of information, the need for exploration and understanding the semantic features is more and more important and necessary. The long documents, however, contain so much redundant information, which takes our less concentration on the crucial topics. Summarization is the task of catching the critical information from the input documents to create the short and meaningful summary. In common, summarization task is classified into extraction and abstraction. In the reason that the extractive summary created by selecting the original sentences still contains the redundancy, we choose the main topic in this thesis on Abstractive Summarization task, which is more difficult and significant in practice.

Abstractive summarization is the task of interpreting the meaning of the input documents to generate or rephrase the concise and worthwhile summary. However, text understanding is still the obvious challenge in Natural Language Processing. The difficulty comes from the variety and complexity of human language. In the sense of computational processing, the length of the text is also the huge problem. In spite of these difficulties, it is the motivation to design the automatic summarization system which is extremely useful in practice. Thanks to the summarization system's strength, we can save the time and cost of information processing and storage. Even, it is also used in the social text processing to reduce the length of text in many applications.

With the observation of the drawbacks in text understanding and the previous latest solutions, we propose the novel model with the combination of the different networks and techniques. First of all, we present the most popular approach is used in Abstractive Summarization. It is the Sequence

to Sequence model based on the development and success of Deep Learning networks. In these models, they use one kind of network like Convolution Neural Network (ConvNet), Recurrent Neural Network (RNN) and so on to embed the content of input document. After, they use another network to generate the summary sequence in the decoding phase. The quality of these model is based on the strength of the internal integrated networks.

This thesis presents our research on Abstractive Summarization and our contributions in this topic: (1) we propose the combination of ConvNet and RNN-based network to extract both the global and local features of sequence from the input; (2) we integrate the bilinear attention mechanism into our decoding phase which reduces the redundancy and replication in the input and the output in generating step; (3) we apply Reinforced Mechanism into our encoder-decoder model with my proposed modification on reward score which is proved its effectiveness in the experiments.

First of all, we propose the novel encoder model by combining two different kinds of neural networks in the same part. With the local features extraction's strength of ConvNet, we add the essential global meaning of sequence to create the high representation of the input. In the experiment results, this combination proved its importance to map the input sequence into the meaningful vector space.

Secondly, we apply and implement bilinear attention scoring functions in our model. To overcome the drawback of the long documents, we use the intra-temporal attention which is to eliminate the redundancy and emphasize the importance in the input sequence. Simultaneously, we use the intra-decoder attention scoring function to evaluate the effect of the previous words in the generated summary into the current predicting step. It helps us to avoid the replication of words in the summary.

The last but not least, we apply Reinforced Mechanism into our model to get it closer and closer to the real-world object. By adding the environment's feedback through the reward function, our model gets more robustness and practical ability. In this sense, we also propose the new reward function for Abstractive Summarization problem as the average of three different scores in the evaluation.

In the experiment, the dataset we use is CNN/Daily Mail. The characteristics of this dataset are the massive volume of samples and the considerable length of input and output sequences for each sample. With many experiments, we prove that our proposed model is extremely effective and useful. In this sense, it also outperforms the previous works by 1% incre-

ment of ROUGE-1 and 0.4% of ROUGE-2 in Abstractive Summarization. It is a positive signal to show the strength of our proposed model in practice.

Keywords: abstractive summarization, reinforced mechanism, bilinear attention, neural encoder-decoder model, combined objective