PosterBot: A System for Generating Posters of Scientific Papers with Neural Models

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Abstract

Posters are broadly used to present the important points of academic papers and can be seen as a special form of document summarization. However, the problem of automatic poster generation is under-investigated. In this paper, we present PosterBot, an automatic poster generation system for academic papers. Given a scholarly paper, PosterBot takes three steps to generate the poster. It first selects the most important sections, and then generates corresponding panels from them. Finally, all panels are integrated to get the complete poster. The demonstration shows the efficacy of our proposed system.

Introduction

Nowadays, there are more and more scientific papers. Many researchers rely on materials like slides and posters to present their work in an effective and expressive way. However, it takes much effort to make these materials from scratch. A model that automatically generates slides or posters can help save time. In fact, there are several prior works on automatic slides generation (Yasumura, Takeichi, and Nitta 2003; Sravanthi, Chowdary, and Kumar 2009; Hu and Wan 2013; Wang, Wan, and Du 2017; Sefid and Wu 2019; Fu et al. 2021; Li et al. 2021). But the problem of automatic poster generation has so far been under-investigated.

A typical academic poster is composed of several panels, and each of the panels focuses on its own aspect. Apart from text, some panels also include graphical elements such as figures and tables. Previous research on this problem hypothesizes that each section of the paper is aligned to one panel of its corresponding poster (Paramita and Khodra 2016; Qiang et al. 2016, 2019). However, this is often not the case. Some sections are not important enough and are not chosen to be displayed because of the limited space of poster. What's more, previous works neglect the significance of content extraction and merely deploy simple summarization models such as TextRank for this part. Thus, the content of their generated posters are not good enough. To address the shortcomings of previous work, we propose an automatic poster generation system which takes three steps, namely section filtering, content extraction, and poster composition.

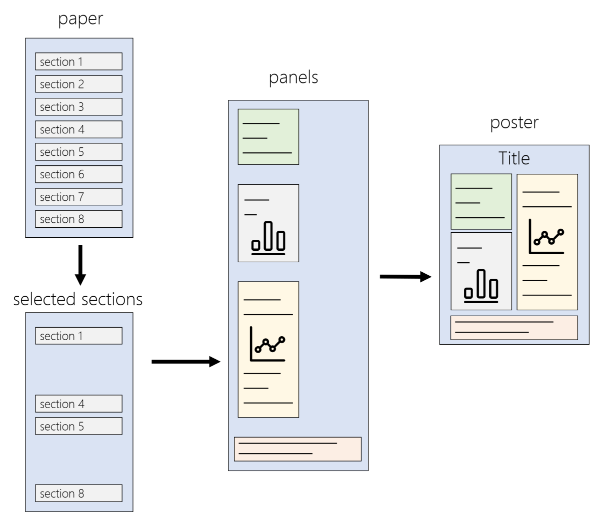

Figure 1: The framework of PosterBot.

Especially, we focus on the step of content extraction, and deploy an extractive summarization model which learns the importance of sentences and graphs jointly. The details of the models are described in section System Overview.

System Overview

Figure 1 demonstrates the framework of PosterBot. At the first step, it takes all sections of a paper as input and removes the sections which are not important enough. Specifically, we use RoBERTa pretrained model (Liu et al. 2019) to encode text of sections, because it performs well on natural language understanding. After getting vector representations of all sections, the model further deploys a transformer encoder to learn their paper-level semantic information. Then a classifier evaluates each section's importance score and decides whether to choose it to be displayed in the poster. The positive/negative labels of sections are attained by human evaluators given the paper and the poster.

At step two, given a remaining section, a summarization model extracts the important sentences and related graphs simultaneously to get its corresponding panel. We find out that it is difficult for models to capture the information of pictorial elements from academic papers. We suppose that

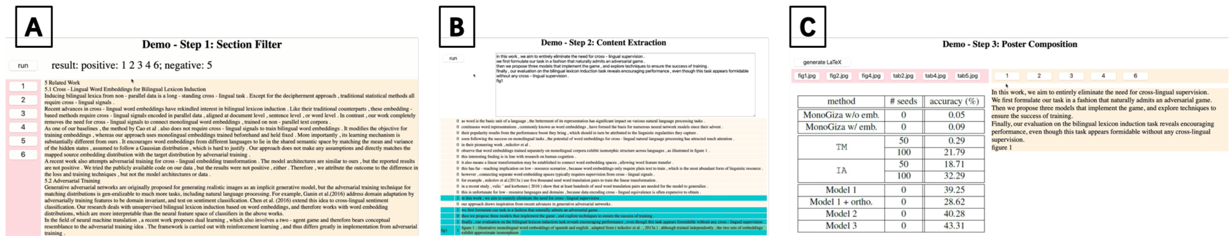

Figure 2: Snapshots of our three-step system: (A) Section Filtering; (B) Content Extraction; (C) Poster Composition.

it is mainly because the graphs in papers are abstract and hard for models to understand. Luckily, most figures and tables are accompanied with captions which explain them in natural language text. So we decide not to use the images of graphs but to use their captions instead. The model first encodes both section sentences and graph captions with a RoBERTa model. In order to utilize the semantic information from each other and get their section-level features, it further uses a transformer encoder. The sentences of the section, together with the captions of graphs, are regarded as a sequence. We make use of reference relationship between the section sentences and graphs. Specifically, in the self-attention module of transformer encoder, we additionally increase the attention weight between a sentence and a graph if the sentence refers to that graph. This can help the model learn the relationship of sentences and graphs better. After that, a module calculates their importance scores and selects the most important sentences and graphs to form the panel until the length limitation is reached.

After all panels are generated, the final step is to integrate the panels to get the poster. For step three, we predefine several poster templates, which include both portrait and landscape formats. After the user chooses the format, the model will search for proper templates based on the number of panels, word length, graph number, graph size and other properties. It outputs a LaTeX document of the poster which makes use of tikzposter package. Authors can also make further modification on the basis of the LaTeX document to get customized poster.

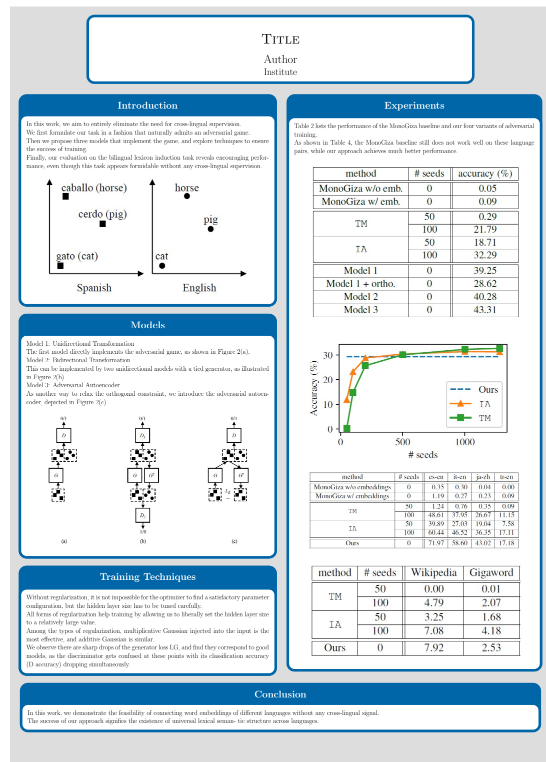

Figure 3: An poster generated by PosterBot. It is portrait formatted and consists of two columns.

Demonstration

Our demonstration system is shown in figure 2. At first, it takes text of all sections as input, and then outputs the predicted labels of these sections. Then for a certain section, it extracts the most significant content to get the corresponding panel. Each line represents a section sentence or the caption of a graph, and the selected ones are highlighted. Finally, provided with text and figures of all panels, it arranges the layout of panels and returns a LaTeX document of the poster.

In figure 3, we present a poster generated by our three-step method. As shown, it consists of 5 panels, and each focuses on its own aspect. The first panel on the left column introduces the background and purpose of their research. Then, the following two panels describe their proposed models and some techniques during training respectively. The panel on the right displays their experimental results with some graphs. The last panel of Conclusion summarizes their work. The section of Related Work from the original paper is not selected during the first step, and it is not displayed in the poster. In the video, we further demonstrate the complete process of our proposed system. Please refer to that for more detailed information.

Conclusion

In this paper, we present PosterBot, a three-step system to automatically generate posters from scholarly papers. The demonstration shows the effectiveness of our system. For future work, we will try to merge the three steps and tackle this problem with one complete model.

Acknowledgments

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