Margin Call: an Accessible Web-based Text Viewer with Generated Paragraph Summaries in the Margin

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Abstract

We present Margin Call, an accessible web-based text viewer that automatically generates short summaries for each paragraph of the text and displays the summaries in the margin of the text next to the corresponding paragraph. On the back-end, the summarizer first identifies the most important sentence for each paragraph in the text file uploaded by the user. The selected sentence is then automatically compressed to produce the short summary. The resulting summary is a few words long. The displayed summaries can help the user understand and retrieve information faster from the text, while increasing the retention of information.

1 Introduction

Long documents can be difficult and time-consuming to read and comprehend, especially for people with reading or visual impairments. Before deciding whether to read a document or to find some information faster, it may be helpful to have an overview first. However, this is not possible with screen readers or without advanced skimming/reading skills. Moreover, it is easy to lose track of the overall story and message. Previous work showed that presenting a brief summary for each section of a text can help readers understand a text better (Kintsch and Van Dijk, 1978; Wiley and Rayner, 2000; Gehrmann et al., 2019), increase the reading speed (Bransford and Johnson, 1972) and improve the recall of content (Dooling and Lachman, 1971; Smith and Swinney, 1992).

To that end, we introduce in this work a web-based assistive text viewer that presents a document in an accessible way. The tool is accessible online at `https://github.com/Franck-Dernoncourt/margincall`.

2 Margin Call

Margin Call is an open-source web-based text viewer that provides the user with automatically generated summaries obtained from individual paragraphs in a text. It uses an extractive summarizer to obtain the best sentence for each paragraph, which is then compressed using a deletion-based sentence compressor.

2.1 Model

A common approach for text summarization uses information obtained from the content of a sentence to classify them as a whole (Cheng and Lapata, 2016; Dlikman and Last, 2016). This approach has limitations when using traditional hand-crafted feature functions and requires powerful sentence representations when applying a data-driven approach. Margin Call addresses this issue by scoring sentences on a word-level while still extracting full sentences. Margin Call uses the sentence extracted from the extractive summarizer and passes it to a deletion-based compressor. The compressor is based on a neural Semi-Markov Conditional Random Field, which decides whether a word should be included in the compressed output.

2.2 User Interface

Margin Call displays the generated summary next to each corresponding paragraph and highlights the sentence in the paragraph the summary was extracted from, as shown in Figure 1. This lets the user know which sentence in the paragraph was used to produce the summary.

2.3 Accessibility

Margin Call was developed to be accessible for users with various visual impairments. Research has shown color-blindness has an impact on the

With Text

Skimming is seen more in adults than in children.

Skimming is a process of speed reading that involves visually searching the sentences of a page for clues to the main idea or when reading an essay, it can mean reading the beginning and ending for summary information, then optionally the first sentence of each paragraph to quickly determine whether to seek still more detail, as determined by the questions or purpose of the reading. For some people, this comes naturally, but is usually acquired by practice. **Skimming is usually seen more in adults than in children.** It is conducted at a higher rate (700 words per minute and above) than normal reading for comprehension (around 200–230 wpm), and results in lower comprehension rates, especially with information - rich reading material. Scanning is the process where one actively looks for information using a mind - map (organizing information in a visually hierarchical manner that showcases the interrelatedness of the information for better retrievability) formed from skimming. These techniques are used by meta - guiding your eyes. Scanning includes the main point as well as headings and important information.

Summary Only

Speed claims have been controversial.

Figure 1: The interface of Margin Call displays summaries generated for each paragraph, allowing the user to decide to view the summary with the text it is generated from or by itself.

readability of web applications (Sparks, 2019). When developing the program, we decided to display the values in an HTML table to make the content easy for screen readers to interpret. The extension ChromeVox was used to test how a blind user would experience the website with the aid of a screen reader.

2.4 Implementation

The summarization models are implemented in PyTorch, the web interface relies on Flask, and the application is packaged as a Docker image.

3 Conclusion and Future Work

Margin Call is an easy-to-use and accessible web application that summarizes each paragraph of a text, thereby making state-of-the-art summarization techniques available to anyone. The summaries are displayed next to each paragraph, which help the reader understand, retrieve and memorize the information faster.

As extension of Margin Call, one could explore automatically segmenting text into paragraphs in case the text does not contain any paragraph, or if a paragraph is too long. Another improvement could be to allow the user to add some bias reflecting which aspect(s) of the text (e.g., "science" or "financial markets") they care the most about, so that the generated summaries reflect the user's interests.

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