

GPT-3 supported paper analysis

Exposé

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Abstract

As time passes on, people seem to have less and less time. When trying to read long and even complicated papers, the time to do so seems to be minimal in everyday life, and a key factor in large literature research. As GPT-3 established itself as an extremely powerful language model, we want to test its applicability to scientific text. In this exposé we lay out our intentions to develop a prototype that supports automated analysis of papers with the help of GPT-3, namely summarization and topic classification.

Motivation: Why are you pursuing this research

The Motivation behind this research is to simplify the process of reading and understanding scientific papers. Within the project a prototype will be developed to help readers to get an easier and especially faster implication of the content of a scientific paper. The prototype will be based on one of the most advanced artificial intelligences which is called GPT-3 and will be discussed later.

Furthermore, the project should give an overview of what the GPT-3 is capable to perform in terms of the use cases for academic research. In the AI community, there are thousands of blog posts which represent GPT-3 as a milestone for AI technology. This research should investigate if GPT-3 is also capable of progressing further in scientific research. GPT-3 has an enormous skillset, but the main functionality is to generate text from textual input.

Problem: What is the larger theoretical / practical problem your research tries to contribute to?

For many readers its very exhausting to read academic papers, especially if the topic is new for the reader or the topic is new in general. This is most likely based on the fact that most are rather long. Not all readers are capable of reading and understanding such long and complicated texts, especially if having to do so for a large number of papers. Furthermore, the process of understanding is limited by the individual semantics and writing style of an author and the understanding of the reader.

We see it as a possible limitation of the scientific progress that many people don't want to read long scientific texts and aren't able to invest large amounts of time to gain the presented knowledge. In a society where people are always stressed, there is less time for self-education.

Research Question: What is / are the specific research question(s) tackled in your project?

In view of the aforementioned problems, we want to ask: Is GPT-3 capable of producing acceptable results when working with scientific text? Are those results similar to the ones that are observable when GPT-3 solves summarization or classification problems that are formulated in everyday language. And furthermore, does the output that is generated by GPT-3 change the original meaning of the scientific text?

Goal: What is the expected outcome of the research project?

The detailed goal which should be reached in this project is a functional prototype, or respectively software artifact, that provides the functionality to help with the reading and understanding of scientific papers. In detail, we plan to implement several functionalities, that benefit from the capabilities of the GPT-3 model:

Most importantly, long and complicated text passages which regularly occur in scientific papers should be able to be automatically summarized by the tool. In addition, being able to ask questions regarding the

content that will be answered by the model in a simple and structured way is also a possibility. Then we plan to include a general topic classification of the paper.

Further functionalities that are conceivable will be tested while developing. Those include, but might not be limited to:

- Generating content quotes based on marked text
- Explanation of pseudo code
- Generate python code from pseudo code
- Explanation of mathematical formula
- Generate python code from mathematical formula

Background: Which concepts, theories, research streams, topics (...) are relevant to understanding your research and contribution?

First and foremost, the most important resources are papers that themselves employ GPT-3 based approaches to problems or even developed full instantiations, leveraging the model. Solutions that took advantage of the summarization or classifications capabilities of GPT-3 might prove especially useful for us, as they probably had to tackle similar problems and can act as a first guide on any potential pitfalls, how those problems were already approached and how these approaches then performed. So, a literature review of the current state of, albeit limited, research regarding implementation of the model is a must. Nevertheless, there are further instantiations that were not published as a paper, but developed as a side project, quick prototype or sometimes even finished product and then presented in an article, blog post or other medium. While these projects might not be developed with rigorous scientific standards, we are still in the early stages of working with GPT-3, and the experience that is presented there should not be ignored, although handled with the appropriate caution. Further resources are papers on transformers and autoregressive models, that should provide the necessary theoretical background.

Approach: How do you plan to get from the research question to the research goal in a scientific way, including which methods do you apply and why?

To answer the proposed research question, we plan to follow the ideal Information Systems research process, consisting of analysis, design, evaluation, and diffusion, in that order. We will be starting with a literature review, where we plan on analysing current approaches and implementation that are comparable to our intentions, allowing us to compare and evaluate current ideas. With the gained knowledge we can then start the design process of our currently theorised features, basing the realization off analysed approaches or incorporating our own ideas and theories, situationally dependant. We will begin by developing and testing features through the process of method engineering. The features that are showing an acceptable performance will then be implemented in a small prototype construction. To evaluate the prototype and its functionality we are planning to let it be tested and reviewed independently by experts familiar with the problem scenario. The results will then be compiled in a paper and peer reviewed.

Project Plan:

As the research is being done for a seminar, the project plan will be structured along the seminar sessions. The tasks listed are to be done after the session they are listed next to.

Session:	Tasks:
1	<ul style="list-style-type: none"> • Topic allocation • Supervisor meeting • Project conception
2	<ul style="list-style-type: none"> • Exposé • Project plan • Exposé presentation

3	<ul style="list-style-type: none">• Literature research• Design functionalities• Start development of tool/prototype
4	<ul style="list-style-type: none">• Continue tool/prototype development• Evaluate functionalities• Start implementing functionalities• Status presentation• 1st Paper draft• Paper feedback
5	<ul style="list-style-type: none">• Finish functionalities• Finalize tool/prototype• Status presentation II• 2nd Paper draft• Peer-review other papers
6	<ul style="list-style-type: none">• Final paper• Submit paper and tool/prototype
Table 1. Project Plan	