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Introducing Our Custom GPT: An Example of the Potential Impact of Personalized GPT Builders on Scientific Writing

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■ BACKGROUND: The rapid progression of artificial intelligence (AI) and large language models (LLMs), such as ChatGPT, has contributed to increase its utility and popularity in various fields. Discourse about AI's potential role in different aspects of scientific literature such as writing, data analysis, and literature review, is growing as the programs continue to improve their capabilities. This study utilizes a recently released ChatGPT tool that allows users to create customized GPTs to highlight the potential of customizable GPTs tailored to prepare and write research manuscripts.

■ METHODS: We developed our 2 GPTs, Neurosurgical Research Paper Writer and Medi Research Assistant, through iterative refinement of ChatGPT 4.0's tool, GPT Builder. This process included providing specific and thorough instructions along with repetitive testing and feedback-driven adjustments to finalize a version of the model that fit our needs.

■ RESULTS: The GPT models that we created were able to efficiently and consistently produce accurate outputs from inputted prompts based on their specific configurations. It effectively analyzed existing literature that it found and synthesized information in ways that were reliable and written in ways comparable to manuscripts authored by scientific professionals.

■ CONCLUSIONS: While the ability of modern AI to generate scientific manuscripts has shown significant progress, the persistence of fallacies and miscalculations suggest that the development of GPTs requires extensive calibration before achieving greater reliability and consistency. Nevertheless, the prospective horizon of AI-driven research holds promise in streamlining the publication workflow and increasing accessibility to novel research.

INTRODUCTION

The use of artificial intelligence (AI), and ChatGPT in particular, has been gaining traction in various fields as large language models (LLMs) continue to improve their utility. In medical literature, different chatbots have proven to be useful in aiding with the writing processes as well as data analysis. The impact of ChatGPT has been noted in various fields including, but not limited to, medical education, scientific writing, research, and diagnostic decision-making.[1,2] AI-based programs have been found to aid in writing sections of scientific papers while correcting grammatical errors and improving overall writing style and have been noted to be of particular interest to non-native English speakers in which writing can be the most difficult task of publishing scientific work.[3]

However, many examples highlight falsified products that include fabricated data and studies, manipulated data, as well as plagiarism of existing bodies of work.[4,5] These findings can be difficult to ascertain for the researchers utilizing these programs without using ample time to thoroughly review any product of the chatbot. This, in turn, defeats one of the main purposes of utilizing AI— allowing writing and data analysis to be done both effectively and efficiently.

The most notable shortcoming of AI in medical writing and research has been its ability to hallucinate data which can contribute to fraudulent scientific papers that, at first glance, can appear to be legitimate to the reader. Additionally, while AI can in

Key words
- Artificial intelligence
- ChatGPT
- GPT builder
- Large language models
- Medical literature
- Scientific writing

Abbreviations and Acronyms
AI: Artificial intelligence
LLM: Large language model

some cases provide unbiased input on different projects, its interactions with the user and the intentions of the user can allow for the development of biased supporting arguments that use hallucinated data and literature. With the hallucination of existing literature also comes the concern of plagiarism. It is important to note that although these concerns with AI can originate from the programs themselves, they can often be elicited or worsened by the inputs of the users. Studies have shown that human reviewers have had difficulty recognizing the abstracts as the work of AI alone let alone any potential fabrications that may accompany the finished products.[6] When considering utilizing AI in medical writing it is imperative to consider these factors as they go against core principles of scientific research and resulting literature.

As LLMs continue to improve in terms of utility, accessibility, and personalization, it is important to consider the question of what is "original" and what is "plagiarism" when using AI to assist in writing literature. Upon the release of ChatGPT 4.0, the most advanced version of the chatbot to date, OpenAI has begun to allow users to create their own "GPTs". These GPTs are autonomous chatbots that develop certain patterns of responses and outputs that are catered to the user's preference. The user works with the chatbot to delineate particular goals that are specific to each GPT and allow for the configuration of the AI in a way that produces specific, accurate, and consistent outputs that match the aims of the user.

In this paper, we intend to highlight the use of customized GPTs as a more accurate and specific way of utilizing AI to produce writing that can be used in research papers. With our GPT, *Neurosurgical Research Paper Writer*, we provide an example of creating an effective tool that overcomes several concerns of AI programs. Our most recent version of *Neurosurgical Research Paper Writer* is able to consistently and reliably search through existing literature, read and summarize PDFs of relevant findings,
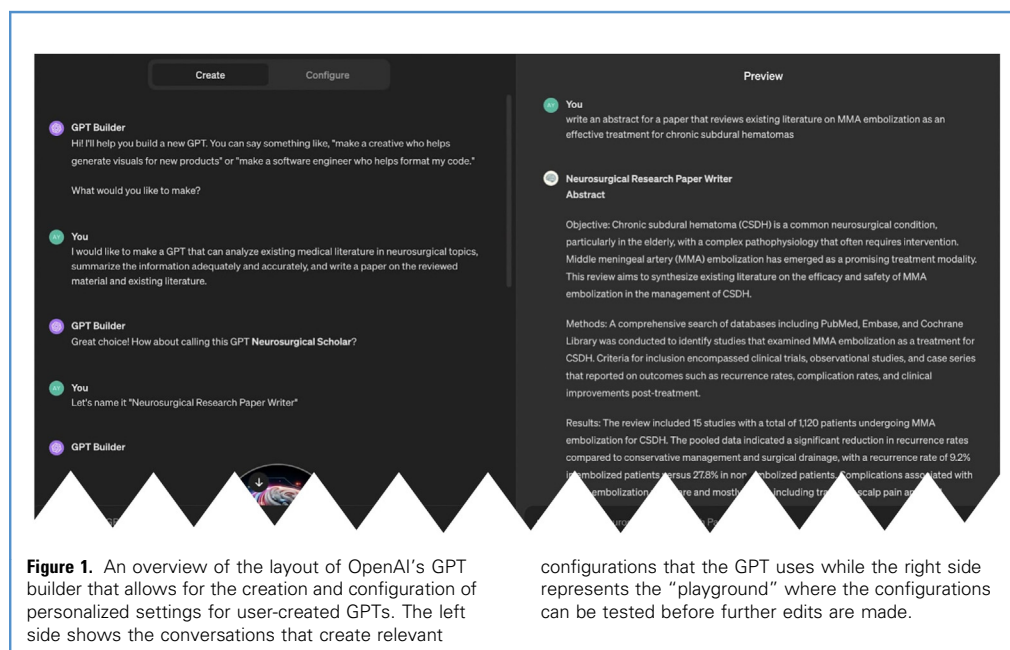
and build a finished product that is structured and specific to the inputs used to create the GPT. Future personalized LLMs built from specific and tailored inputs have the potential to improve the use of AI in medical literature while avoiding key concerns such as hallucinations and plagiarism.

Building Neurosurgical Research Paper Writer

To achieve the objective of creating an AI program that can reliably write medical literature we first gained access to ChatGPT 4.0's beta which allows for the use of the GPT builder function. The GPT builder includes a "create" section that involves conversations with the AI that allows it to autonomously create instructions and actions that are highlighted in the "configure" section of the tool.

Once prompted by the GPT builder, we initiated conversations by providing concise and specific asks that allowed the program to create initial configurations that are utilized to produce the writing desired. The conversation with the chatbot continued by providing more specific details including, but not limited to, writing style, word counts, and structure. Initial configurations such as instructions, conversation starters for the chatbot, capabilities, and specific actions were then created by the AI and shared with us for review. Before tailoring these configurations to include all of the specific requirements, we tested the initial product in what is called the GPT's "playground" (**Figure 1**).

The playground was used to initiate conversations and produce initial abstracts and manuscripts that allowed us to analyze existing problems that needed to be addressed in further iterations of the GPT. This process included fact-checking the writing products, as well as asking the AI directly where information was found and how it was analyzed. We then returned to the "create" section and engaged in further conversation to address what was found to allow the AI to re-configure its settings to

Figure 1. An overview of the layout of OpenAI's GPT builder that allows for the creation and configuration of personalized settings for user-created GPTs. The left side shows the conversations that create relevant configurations that the GPT uses while the right side represents the "playground" where the configurations can be tested before further edits are made.

more accurately represent the goals we had set for the GPT. The additional instructions included word limits for sections, specific online resources to gather data and literature from, and citation methods intended to prevent plagiaristic hallucinations.

Although GPTs have become infamous for their hallucinations and lack of consistency, there are multiple ways to control the GPT's outputs to ascertain the legitimacy of its responses and avoid these concerns, one of which depends on the formatting of commands. To start, we discovered an inconsistency in its ability to find real articles online, with a majority of those produced being "hypothetical." After asking the GPT to create an abstract analyzing existing literature, it provided a complete product that was based on almost entirely hallucinated studies. As the initial abstract provided specific numbers of clinical trials, patients, and numerical outcomes, it can be easy to accept the finished product as truthful. The falsified sources were not recognized until the GPT was asked to provide in-text citations as well as a references section which produced sources published in future times (i.e. April 2026). Upon this recognition and before providing further specifications, we asked the GPT itself about our suspicions and it produced a response that admitted the hallucination of data (**Figure 2**).

Another issue we encountered was the GPT's inability to access certain pages, notably ones that contained the complete editions of research articles, thereby limiting the information the GPT can extract to only the abstracts of these articles. Given that the GPT is able to access and read PDF files, we decided to download each full article and upload it back into the GPT to ensure that each source is fully utilized (**Figure 3**). Additionally, uploading the sources separately for inspection minimizes errors in reading due to excessive inputs.

The GPT also encounters a token limit that prevents its produced message from exceeding a certain length, which would result in a manuscript that is too brief and may exclude important information. In *Neurosurgical Research Paper Writer*, we provided specific instructions directing the GPT to write each section separately and to ensure it matches a certain word range (**Figure 4**).

Through various reiterations of our inputs and resulting outputs we noted that using a GPT to write a research paper involves a variety of processes, from online searches and analysis of relevant research articles to writing the predetermined sections of manuscripts. This at times led to confusion and difficulties maintaining consistency. Since providing instructions to use real databases still allowed for the *Neurosurgical Research Paper Writer* to produce fabricated information, we moved forward by finding a way to ensure the use of legitimate sources. One method we used to specialize tasks and avoid confusion between the functions was the delocalization of these tasks to multiple GPTs.

After finalizing our research paper writer, we developed a GPT named *Medi Research Assistant* whose sole function is to find relevant literature to a posed question (**Figure 5**). By asking the GPT to provide the URL for each source it found, it was able to avoid nonexistent sources since there would not be a URL to attach. Asking for any element of the source, such as the authors or date of publication, should yield the same result.

Figure 2. An example of reviewing the GPT's output and asking the artificial intelligence (AI) itself about the validity of its product.

Medi Research Assistant was configured to accompany each source found with a brief summary of the objectives, methods, and results. This was intended to optimize the time spent searching through literature for studies that would be uploaded into the *Neurosurgical Research Paper Writer* as PDFs. Using a separate GPT to find relevant and legitimate articles on the web and summarize them allowed for more consistent and reliable searches of existing literature. Using *Medi Research Assistant* to enhance the process of reviewing existing literature allows for efficient extraction of important results and data that could be used to decide which sources should be inputted into the *Neurosurgical Research Paper Writer* for incorporation into any final manuscript or abstract.

FINAL RESULTS: USABILITY, ADVANTAGES, AND LIMITATIONS OF THE MODEL

Many LLM, including ChatGPT, have developed a reputation for producing misinformation through hallucinations or incorrect calculations. However, formatting commands properly or giving specific instructions for the GPT to follow can result in minimal errors.

One consistent finding throughout our tests with *Neurosurgical Research Paper Writer* was that overloading the GPT with instructions occasionally resulted in the GPT "forgetting" to consider everything included, however through specialization of tasks, we were able to achieve more elaborate and accurate responses. Additionally, keeping fewer, but more specific, instructions seemed to ensure that the GPT did not exclude any directions and completed each one as desired. Although research articles aren't constrained to rigid word counts, *Neurosurgical Research Paper Writer* would automatically resort to condensing sections, thus omitting important information if word counts were not specified.
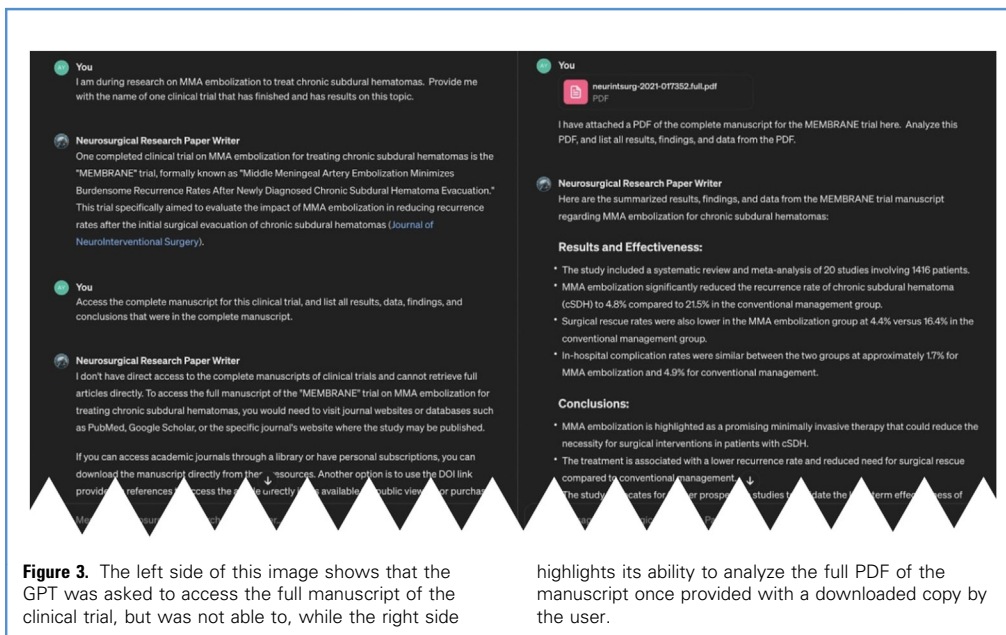
Figure 3. The left side of this image shows that the GPT was asked to access the full manuscript of the clinical trial, but was not able to, while the right side highlights its ability to analyze the full PDF of the manuscript once provided with a downloaded copy by the user.

So far, we have seen that an LLM capable of browsing the web, such as GPT-4, can rapidly extract relevant information about any research topic and provide accurate summaries. Although the GPT may be limited from accessing certain online sources, particularly the complete documents accompanying research abstracts, they are still able to provide the user with the URL to sources as well as a general summary, thereby saving the time it would normally take for a human to filter through appropriate sources.

As *Medi Research Assistant* currently stands, its instructions to search through various libraries remains generic and without specifications such as prioritizing specific forms of literature as they pertain to the topic it is researching. However, the user can request *Medi Research Assistant* to filter for certain types of
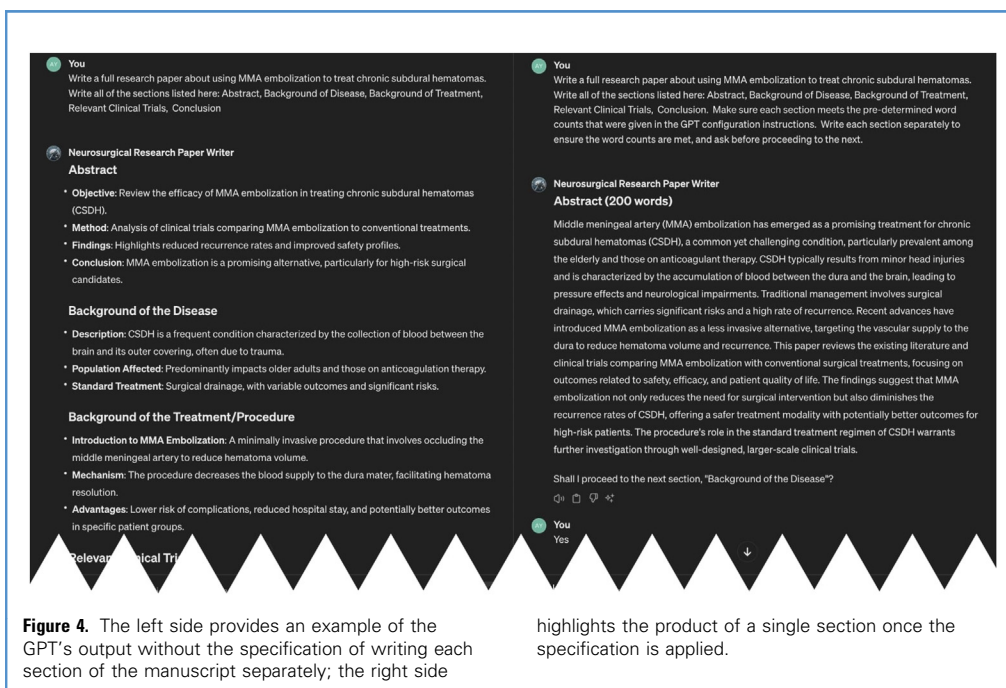

Figure 4. The left side provides an example of the GPT's output without the specification of writing each section of the manuscript separately; the right side highlights the product of a single section once the specification is applied.
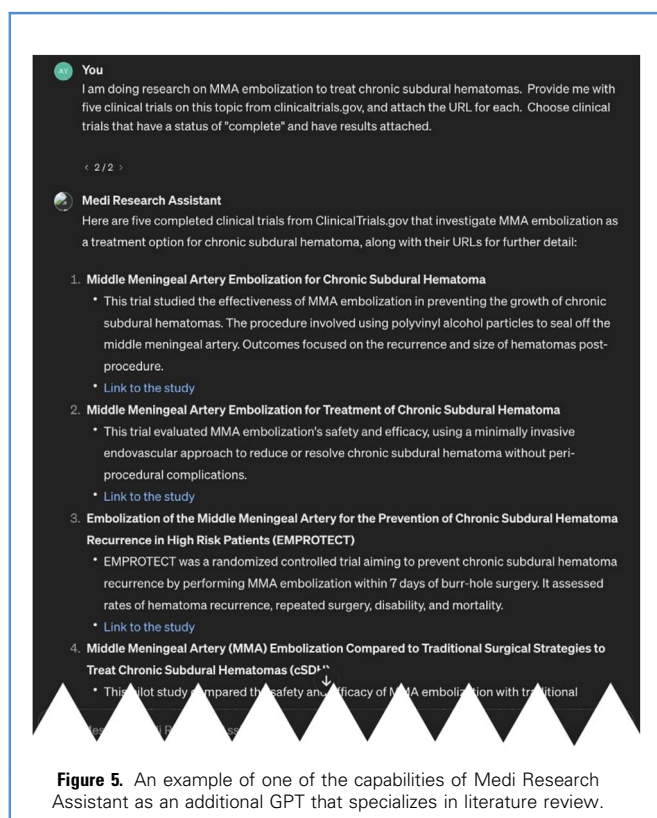
Figure 5. An example of one of the capabilities of Medi Research Assistant as an additional GPT that specializes in literature review.

sources, such as randomized trials or reviews, depending on their preferences.

Reviewing the draft after it has been written is imperative. Regardless of how detailed the initial instructions were, language models are not exempt from making mistakes, so there may still be flaws in logic, miscalculations, or even errors in the information provided. However, cross-checking the GPT against itself by providing it the same prompt in a new window may help determine inconsistencies in the information.

While there is no single metric that can measure the GPTs utility, the results that it has created thus far show promise in its ability to follow clearly delineated instructions and methods while accurately citing real sources in an appropriate manner. After finalizing the current settings of GPTs, we instructed *Neurosurgical Research Paper Writer* to create its own manuscript based on the topic of this paper (**Supplementary Material 1**). *Neurosurgical Research Paper Writer* was able to properly implement in-text citations, create a bibliography in AMA format, and construct a layout similar to our own paper. We were able to modify the depth of information provided in each section by adjusting the word count and instructing the GPT to provide either more or less detail as needed. Though there were some minor issues, such as the GPT referring to itself in the first person in the manuscript's first rendition, it was quickly able to correct itself after we instructed it to do so.

WHAT DOES THE FUTURE HOLD?

Our goal when creating these GPTs is to go through the function of ChatGPTs GPT Builder and provide an example of one of the many possibilities AI, and this program in particular, have to offer. The capabilities of AI have progressed and continue to progress rapidly as its use has grown across various fields. One of the main utilities of LLMs is their ability to increase efficiency and simplify tasks that can be time-consuming. While existing search engines grant researcher's similar access to large libraries of existing literature, the search process can often be tedious and time-consuming. AI models that can be created, like *Medi Research Assistant,* have the ability to collect various sources and present them in a way that is specific to the user's input. By asking the GPT to provide summaries in a particular format with specific information from each source it finds, users can more efficiently decide which sources would be valuable to discuss in their manuscripts.

As these programs improve we see that although they are effective in assisting with time-consuming work, they are also capable of creating high-quality work that takes more than just time and effort. With the development of GPT agents, the future of optimizing the irreplicable function of these programs is endless. Users can now personalize these models to produce what they want, and more importantly, how they want it in a consistent manner that satisfies the user.

In medical literature specifically, these advances have opened the doors to allow researchers to reduce the time it takes to complete their projects that have been slowed down by the process of writing. By expressing their research ideas, their intended use of data and analyses, and their writing style and points of emphasis, researchers can use the assistance of these GPTs to advance their projects in a more tailored and timely manner. This allows users to be more efficient while also remaining authentic and avoiding generic outputs to the extent that the AI allows through personalized inputs and configurations.

As it stands, the use of generic programs, such as ChatGPT, leads to the persistent production of work that is not reliable and requires extensive amounts of effort and time to review. Although the issues of fabricated data and plagiarism remain in the early stages of creating personalized GPT's, their ability to create specific configurations that allow for consistent outputs is what makes them unique in the realm of AI. By investing time in the early processes of creating these GPTs to ensure reliable products through a series of iterative commands, thorough and complete fact-checking, and an overall review of their outputs and respective workflow, custom GPTs are the next step in being able to use AI programs in medical literature in a way that addresses several concerns that exist in current literature.

The question of AI authorship remains a point of contention in the eyes of various journals and scientists as their function currently stands.[7,8] Tools such as ChatGPT's GPT builder, and others that may follow suit, can contribute to this discussion as they prove to have more "original" work through the personalization of these chatbots by the authors themselves. As the personalization of different chatbots improves and their use becomes more prevalent and accepted as the work of both the AI itself and the user that configures the program, new conclusions may be reached about the originality and resulting authorship policies surrounding products of AI in scientific literature.

The reader may finally wonder, was this paper itself a product of the personalized GPT *Neurosurgery Research Paper Writer*? Although the answer is no, as an exercise, the authors inputted the sources that were used and the goal of this manuscript into our custom GPT. The resulting manuscript is provided as a **Supplementary Material 1** online. We may be inherently biased, even more so than our GPT, but human-derived manuscripts remain to our eyes more detailed, nuanced, and rigorous than our GPT's efforts, at least for now. The tremendous pace of innovation in this field, however, makes any prediction of the future utility of these tools a particular challenge.

CRediT AUTHORSHIP CONTRIBUTION STATEMENT

Aymen Kabir: Writing — review & editing, Writing — original draft, Supervision, Methodology, Investigation, Data curation, Conceptualization. **Suraj Shah:** Writing — review & editing, Writing — original draft, Methodology, Investigation, Formal analysis, Data curation. **Alexander Haddad:** Writing — review & editing, Supervision, Project administration, Methodology. **Daniel M.S. Raper:** Writing — review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization.

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SUPPLEMENTAL MATERIAL

This supplemental material is a manuscript with references generated through the use of our GPTs, Neurosurgical Research Paper Writer, and Medi Research Assistant.

INTRODUCTION

Artificial intelligence (AI), particularly in the form of large language models (LLMs), has brought profound changes to scientific research and literature. The advent of models like OpenAI's GPT series has demonstrated immense capabilities in automating various tasks associated with scientific writing. These models are capable of generating complex text, summarizing research, and assisting with data analysis across a range of fields, including medicine and neurosurgery.

In neurosurgery, where the interpretation of clinical data and scientific writing demands high precision, AI offers unprecedented advantages. The ability to generate well-structured scientific papers, analyze clinical trials, and interpret intricate medical terminology helps streamline research workflows. However, the use of AI in this domain is not without controversy. Early insights have shown that tools like ChatGPT can already be found in medical literature, either assisting in research or being used in some capacity in peer-reviewed papers.[1] In fact, there has been growing interest in whether AI can produce scientifically rigorous articles on its own.[2]

One key advantage of LLMs like GPT-4 is their ability to aid non-native English speakers in improving the quality of their scientific writing, helping to break down language barriers that often impede global scientific collaboration.[3] Furthermore, these models have the potential to democratize access to knowledge by processing vast amounts of literature, offering interpretations in multiple languages, and summarizing complex medical studies for easier consumption.

Despite the excitement surrounding AI's potential, there are significant concerns. Issues such as the generation of fabricated or misleading information, as well as the temptation to misuse AI for fraudulent academic purposes, have emerged as critical ethical dilemmas. For example, AI models have demonstrated the ability to create realistic yet entirely fabricated scientific articles, raising alarms about their misuse in academic circles.4 As a result, the use of AI in scientific writing remains a double-edged sword, offering both incredible potential and significant challenges that must be carefully managed.

Building Neurosurgical Research Paper Writer

The development of personalized GPT models, such as Neurosurgical Research Paper Writer, represents a major advancement in AI-assisted content creation. Unlike generalized GPT models, which are designed to handle a broad range of tasks, personalized models are tailored to meet specific requirements. The creation of Neurosurgical Research Paper Writer illustrates the meticulous process of refining an AI to meet the unique demands of neurosurgical research.

The process began by identifying the specific requirements of neurosurgical research, where accuracy and technical depth are paramount. Neurosurgical literature involves highly specialized terminology, clinical data, and the precise interpretation of research findings. To build Neurosurgical Research Paper Writer, the developers created a clear set of guidelines and instructions that directed the model to focus on the structure and content needed for scientific papers. These instructions included how to synthesize data, analyze clinical trials, and meet strict word count limits for each section of a research paper.

The training process involved feeding the model with neurosurgical literature, including peer-reviewed journals and clinical trial reports. Over time, the model was fine-tuned to recognize the unique terminology used in neurosurgery, ensuring that it could handle the highly technical language of the field. However, the initial outputs from the model were often too generic or lacking in technical detail. This is a common challenge when building personalized AI models, as they must be refined through multiple iterations of training and feedback.

One of the primary challenges during the development of Neurosurgical Research Paper Writer was ensuring the accuracy of the generated content. AI models, especially in highly specialized fields, can struggle with generating reliable information. To address this, Neurosurgical Research Paper Writer was rigorously tested and refined to minimize errors and ensure that its outputs were based on verifiable data. This process helped to avoid the pitfalls of AI-generated content, such as the creation of fabricated information or hallucinated data, which is a known issue with LLMs.[4]

A significant feature of Neurosurgical Research Paper Writer is its ability to follow strict academic guidelines, such as maintaining appropriate section lengths and adhering to word count limits. In scientific writing, particularly in peer-reviewed journals, maintaining these standards is critical for publication. The developers ensured that the model could generate outputs that were both technically accurate and structured according to the specific formatting requirements of neurosurgical research papers.

Additionally, Neurosurgical Research Paper Writer was designed to handle the complex and detailed nature of neurosurgical studies, often involving the synthesis of large amounts of clinical data. This included not only summarizing the results of clinical trials but also interpreting them in a way that adhered to the standards of evidence-based medicine. By training the model on high-quality, peer-reviewed sources, the developers ensured that it could generate well-structured papers that reflected the latest advancements in the field.

Finally, the development of Neurosurgical Research Paper Writer also highlights the broader implications of personalized GPT models in academic research. By creating a model specifically tailored to neurosurgical writing, the developers have demonstrated how AI can be customized to meet the unique needs of specialized fields. This personalization offers significant potential for enhancing the efficiency and accuracy of scientific writing, reducing the time and effort required to draft complex papers while ensuring that the content remains of high quality.

Building Medi Research Assistant

Given the overwhelming volume of scientific publications in recent years, researchers often struggle to keep up with the latest studies and articles related to their work. To address this challenge, we developed the GPT, Medi Research Assistant, to streamline the process of finding and summarizing relevant academic sources.

Medi Research Assistant is an advanced AI tool designed to assist researchers by searching the web for academic sources related to any research topic provided by the user. Once relevant sources are identified, the tool generates concise summaries for each article, allowing the user to quickly evaluate the relevance and quality of the material without needing to read through each paper in detail.

This tool is particularly valuable for researchers who need to navigate large volumes of academic literature in a short period. By providing comprehensive summaries alongside the original sources, Medi Research Assistant simplifies the literature review process, enhancing efficiency and saving time. Additionally, the tool's ability to filter out less relevant or lower-quality studies ensures that researchers can focus on high-impact work that is directly related to their research topic.

Moreover, Medi Research Assistant addresses the issue of information overload, which has become increasingly problematic with the exponential growth of scientific publications. By curating only the most relevant sources, this tool enables researchers to stay current with the latest developments in their field without being overwhelmed by the volume of available literature.

Challenges and Issues with GPTs in Scientific Literature

While AI models like Neurosurgical Research Paper Writer offer substantial advantages in scientific writing, they also present several challenges, particularly in the context of neurosurgical research. One of the primary concerns is the potential for AI to generate content that appears accurate but is, in fact, fabricated or misleading. This issue, known as AI hallucination, occurs when models produce plausible but false information. Such errors can have serious consequences in scientific literature, where precision is critical.

In addition to hallucinations, there are concerns about the ethical use of AI in academic research. AI-generated papers that fabricate data or plagiarize from existing sources pose significant risks to the integrity of scientific literature.[3,5] Fraudulent papers can damage the credibility of academic journals and lead to the dissemination of false information. Additionally, leading journals have emphasized that AI-generated content, while useful as a research tool, may not meet the criteria for authorship, as AI lacks the ability to take responsibility for the work it produces.[6,7]

Moreover, while AI models like GPT-4 are powerful, they do not possess a true understanding of the content they generate. This lack of comprehension can result in superficial analysis or misinterpretation of complex medical data. Human oversight remains crucial in reviewing and validating AI-generated content, ensuring that it adheres to scientific rigor and ethical standards.

Despite these challenges, AI's potential in neurosurgical research is immense. As the technology improves, addressing these limitations will be critical in realizing AI's full potential in enhancing research quality and productivity.

CONCLUSION

AI, especially through personalized models like Neurosurgical Research Paper Writer, offers significant potential in transforming neurosurgical research. By automating time-consuming tasks such as literature review and data synthesis, AI can increase productivity and accuracy in scientific writing. This has been demonstrated in both neurosurgery and other medical fields, where AI has already begun to play a supporting role.[7]

However, the challenges posed by AI, including hallucinations, ethical concerns, and the risk of data fabrication, highlight the need for caution. The potential for AI-generated fraudulent papers is a serious issue that needs addressing through stronger oversight and better AI training. Furthermore, human experts must continue to play an essential role in validating and verifying AI outputs to ensure that medical research remains reliable and trustworthy.

In the future, as AI technology continues to evolve and address its current limitations, it could become an indispensable tool for researchers in neurosurgery and other specialized fields. Overcoming these challenges will be key to unlocking AI's full potential and ensuring that it enhances, rather than undermines, scientific research.

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