Artificial Intelligence in Medical Writing: An Insider's Insight

Artificial intelligence (AI) driven large language models (LLMs) such as ChatGPT, are revolutionizing writing tasks through their ability to generate high-quality text. It is crucial therefore to consider the ethical concerns that come with their use and how they are deployed. Issues include bias, misinformation through hallucination, privacy, plagiarism and lack of transparency, notwithstanding possible job displacement, the stifling of creativity, authorship concerns and a potential dependence of writers.

We must seek to better understand these concerns and develop strategies to address them. Until these issues are addressed, any text and outputs generated by AI will need to be reviewed and validated by subject matter experts. Appropriate steps need to be built into any delivery models to minimize potential harm and get the most out of these tools.

Before you start

- Writing tools augmented with artificial intelligence (AI) can help you write better (or at least more quickly) by providing suggestions, grammar checking, and more.

- Despite their benefits, there are ethical concerns associated with their potential bias, lack of privacy and potential for misuse.

- It is essential to develop and deploy strategies to address the concerns associated with use.

- Users should always review and validate outputs generated by these models before they are used in any clinical or medical context.

Prepare to succeed

- Given the legal, commercial and reputational risks associated with GAIL model use, companies have started informing employees about their proper use and putting in policies that define permitted appropriate deployment.

- Company guidance should alert employees to the reality that outputs created by AI are imperfect and must be verified by traditional means.

- To manage the risks associated with the use of AI tools it is essential to reconsider permitted and monitored use, transparency of AI involvement and assessment of risk.

Key Insights

Large, and small, language models are AI-enabled generative tools trained on vast volumes of documents to generate natural language text based on very precise prompting. These models can provide text suggestions, grammar checking, and more. Their evolution has seen a gradual increase in their sophistication and complexity, creating ever more powerful and versatile tools [1-3]. These tools are particularly useful if you are looking to improve your writing skills or for anyone who is not a native speaker of the language they are writing in [4].

> Artificial intelligence tools have reached a point where non-experts can use them to support their work with little or no computer background or specialized subject area knowledge.

General AI language (GAIL) models can improve writing efficiency and accuracy. They can help in paraphrasing difficult sentences, facilitate translation, identify spelling mistakes, correct grammatical errors, improve clarity and text flow, generate draft of outlines and abstracts based on the author's full text, format and convert references between different styles, and more.
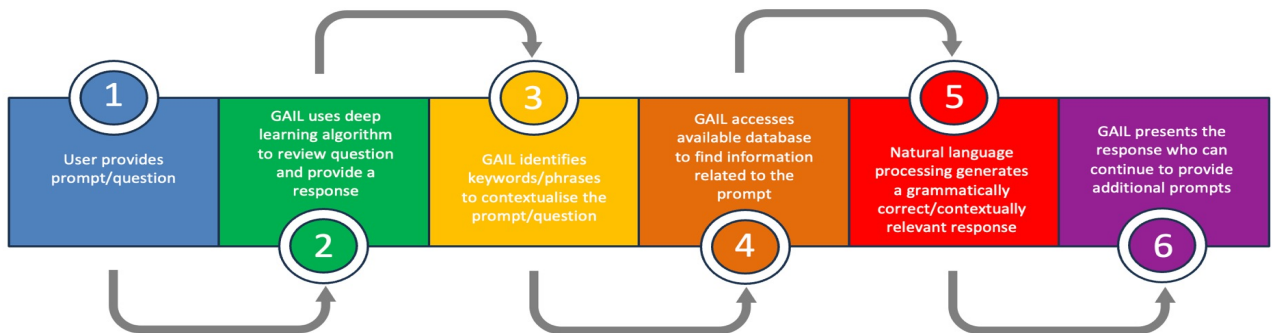
Despite their potential benefits, concerns have been raised over the ethical implications associated with the use of these AI tools, particularly with regards to bias, privacy, and the potential for misuse [5-7]. As such, responsible application, along with appropriate regulation and oversight, is essential to ensure that these AI tools are used appropriately. The risk of misuse increases markedly when users are not fully aware of how they function and their limitations, or if the user employs the technology to summarise information they are not familiar with. And yet, several services are already available online promising benefits of time savings and reduced effort to novice and experienced writers alike.

Consequently, organisations must develop formal strategies to address these concerns and raise awareness of the associated risks. Experts should always review and validate the output generated by these models before they are used in any clinical or medical context. By considering these ethical concerns and taking appropriate measures, we can ensure that the benefits of these powerful tools are maximized, while minimizing any potential harm [6, 8].

> Banning AI use outright gives a false sense of compliance and ignores its potential 'silent' use. A more considered approach is to encourage innovation, monitor use, and ensure the technology is only used openly and appropriately.

What Is a Language Model?

Language models use various statistical and probabilistic techniques to determine the likelihood of a given sequence of words occurring in a sentence. They analyse example text data to provide a basis for their predictions. Large language models, such as OpenAI's Chat GPT-4 and Google's Gemini, handle billions of 'training' data parameters to generate their text outputs. They interpret the data by feeding it through algorithms that establish rules for context in natural language. The models then apply these rules in language tasks to predict or produce new sentences. They essentially learn the features and characteristics of basic language and use those features to generate new phrases [5–8].

| **1** User provides prompt/question | **2** GAIL uses deep learning algorithm to review question and provide a response | **3** GAIL identifies keywords/phrases to contextualise the prompt/question | **4** GAIL accesses available database to find information related to the prompt | **5** Natural language processing generates a grammatically correct/contextually relevant response | **6** GAIL presents the response who can continue to provide additional prompts |

There are several different probabilistic approaches to modelling language and their use often depends on the language model's purpose. Model types differ in the amount of text data they analyse and the mathematical approach they use to analyse it. Unlike their chatbot and automated text response systems predecessors, that relied on rigid scripts and keyword matching, the algorithms used by today's models consider the context, sentiment, and intent of your text. For example, a language model designed to generate sentences for an automated social media bot might use simpler algorithms, a smaller example library and analyse text data in different ways than a language model designed for determining the likelihood of a search query. There are several approaches to building language models of varying complexity and can be used in conjunction with one another.

Potential uses for GAIL models

Language models are capable of producing almost any text, from quick suggestions and recommendations to charming poetry or topic-focused essays. This is why marketers and salespeople, journalists, and even trainee writers (and students) who aren't directly tasked with client copy are already using AI language models to streamline work processes and create what appears to be professional content. Language models offer a plethora of opportunities by which a small business can improve its operations and engage with customers, e.g.:

Chatbots: available 24 hrs to answer common customer enquiries.

Content creation: for websites, social media channels, and marketing materials.

Customer engagement: like on social media platforms, such as Twitter or Facebook, generating responses to customer inquiries or comments.

Language translation: widening global ambition through communication (modest accuracy).

Research and analysis: of customer feedback to identify common themes or issues.

The outputs above are not necessarily required to adhere to any regulatory requirements or follow scientific rigour. In terms of medical writing, proposed uses include generating reports and summaries of medical research papers and clinical trials, creating patient-specific medical information like discharge summaries and patient education materials, assisting in the writing of medical textbooks and guidelines, generating product labels and package inserts for medical devices and drugs, creating a chatbot or virtual assistant capable of answering medical-related questions, and assisting in highly protocolized letter writing, lay summaries and narratives. In all these cases, the expectation would be that any content would be reviewed and edited by a professional and formally approved before release.

Risks associated with GAIL models

Quality: GAIL models are known to produce inaccurate results. When drafting text, they have shown a tendency to cite cases that are irrelevant or (worse) do not exist (hallucinations) [9]. Equally, they can struggle with certain computational tasks, producing incorrect results when asked to derive simple algebraic solutions [10]. In addition to generating incorrect information, it can also display overt gaps in its knowledge. The risk of erroneous communication is lower when the operator is sufficiently informed and experienced to be able to readily recognise incorrect information.

Contractual: GAIL models being offered as online services raises concerns over restrictions regarding the permissions of users to share client's confidential information with third parties (the software company running the GAIL model). Sharing confidential or client data with online tools can potentially violate contractual provisions relating to the purposes for which specific data can be used. When conducting an analysis with GAIL tools, users should keep in mind that the software is most likely using the content provided to 'improve' and/or extend its functionality. Finally, employees have often signed up to use these online services in a personal capacity, and therefore it is not entirely clear where any contractual requirements apply.

Privacy: Care must be taken around sharing of personal information, clients or employees (with the service providers), as this creates privacy risks relating to General Data Protection Regulation (EU GDPR) and other privacy and transparency requirements. Depending on the nature of the personal information being shared with GAIL model, companies may need to update privacy policies, provide notices to customers, obtain consent and/or provide anyone whose data may be shared with opt-out rights, etc. Uses of GAIL models that involve personal data also raise questions about how companies can address deletion rights or requests to remove data from their workstreams (or the model itself once it has 'learned' and modified itself based on the shared data). No personal data should ever be shared with a GAIL model.

Consumer Protection: In cases where users are unaware that they are interacting with GAIL models (as opposed to a human customer service representative), or they receive a document from a company that was generated by GAIL models without that information being clearly disclosed, there is a risk of claims of unfair or deceptive practices under certain laws (aside from the obvious reputational risks). At its most basic level and depending on the circumstances, clients may be upset to discover that they paid for content they later learn was generated by an AI and the product or development process was not identified at point of sale.

Intellectual Property: The use of GAIL models raises several complex IP issues.

- The extent that using GAIL models generates content may not be protectable by copyright since it was not authored by a person (currently the position of the United States Copyright Office).

- It is possible that any text the software produces will be nothing more than a derivative summary of the (potentially) copyright protected materials. It is always possible that the materials used to train a model could be found to infringe the original copyrighted material. In addition, once data has been submitted to a GAIL model for analysis, there is a risk that system users will be able to retrieve a derivative of your data, thereby compromising its confidentiality, implying that such data was not the subject of reasonable steps to preserve its confidential status.

Vendor Intellectual Property: Many of the risks described above also apply to any company data that is provided to or received from vendors. Moving forward, should contracts with vendors clearly specify that information provided by the vendor can or cannot be generated by GAIL models without prior consent?

Managing risk

Given the legal, commercial and reputational risks associated with GAIL models, companies have started training employees on their proper use and applying policies delineating permitted appropriate use [11,12]. Training instructs employees that outputs are not perfect and should <u>always</u> be verified. A brief review of published policies suggests that GAIL use tends to be divided into three categories: (1) uses that are prohibited (e.g., using GAIL models to check for mistakes in confidential company or client documentation); (2) uses that are permitted following managerial authorization (e.g., drafting the Methods section of a manuscript, so long as it is carefully reviewed before it is accepted); and (3) uses that are generally permitted without any prior authorization (e.g., creating internal administrative information such as generating ideas for discussion or suggesting references).

To manage the risks associated with the use of GAIL models, it is essential to incorporate these key considerations in your policies:

External Transparency: Document owners should be aware that any use of GAIL models will only be permitted following formal approval (opt in).

Risk Rating: A formal assessment should rate the risk of using GAIL tools For the proposed task (low, medium or high).

Inventory: All uses of GAIL models must be recorded in a central (company) repository (GAIL inventory) along with the associated risk rating (updating the criteria as appropriate). The record should include a description of the content generated, the specific tool used and the instruction that was used to generate it.

Plagiarism: Authors must ensure that there is no inappropriate use of language that could lead to legal issues and ethical concerns.

Internal Labelling: Content generated by GAIL models should be identifiable or labelled, so that reviewers know that they should pay particular attention to these materials.

Training: Users must have received training on both appropriate (ethical and commercial) and prohibited uses of GAIL models.

Monitoring: The GAIL use inventory should undergo regular review to ensure that tools are being used according to company policies.

Reviewing outputs

Drafting: AI-generated outputs should be viewed as a starting drafts, not the finished product. Although AI can serve as a valuable tool for generating content, it cannot replace the creativity and critical thinking skills of human writers and editors.

Editing: AI-generated content must undergo editorial review to ensure that it is well-written, coherent, and engaging. This includes checking for errors in spelling and grammar as well as ensuring that the content is structured logically and that it is appropriate for the intended audience.

Fact-checking: The sources used by the AI tools are not immediately apparent and it is possible that non-peer-reviewed medical literature is being used to create content [2]. Therefore, AI-generated content must be fact-checked to ensure that all information is accurate and up-to-date. This includes verifying sources, checking statistics, and ensuring that any claims made in the content are supported by appropriately cited evidence [13]. Critical review by medical experts to validate the output generated is crucial. In addition, the field of medicine is constantly evolving, and computer models may or may not be undergoing regular retraining so that they remain up-to-date with the latest knowledge [5–8].

Fairness: Ensure that AI-generated content does not discriminate against any individual or group based on their protected characteristics, such as race, gender, age, or disability.

Plagiarism: Authors must ensure that there is no inappropriate use of language in their document by checking with a plagiarism detection tool. This introduces important legal and ethical concerns [14, 15].

Permitted Use

Fact-Checking: Using GAIL models in the same way as you would Google or Wikipedia to check facts in documents being written or reviewed.

First Drafts: Drafting of speeches, memos, cover letters or routine emails.

Editing Documents: Having GAIL models fix poorly worded paragraphs or correct grammatical errors, provide more clarity and/or generally increase readability.

Brainstorming: Generate ideas and lists of items to be considered for a meeting, policy, initiative or in a company document.

Abstracting: GAIL models are particularly useful at abstracting larger documents, though care must be given 'to what should be shared with the model.'

B2B marketing: Potential use has been explored in digital marketing. Marketers can now focus more on the customer and meet their needs in real-time using AI. AI tools can also be used to analyse the performance of a competitor's campaigns and reveal their customers' expectations [16].

> Despite their potential value, it is essential that these tools are deployed responsibly and ethically, particularly in the clinical setting, limiting its use to specifically identified (safe) areas, ensuring that any AI-generated content is fact-checked and edited by humans, and that data privacy and security are given the highest degree of consideration.

Top Tips

Mastering the art of interacting with GAILs can truly unlock a new realm of information accessibility to boost your creativity. The tool's versatile nature allows for a wide range of inquiries and requests, whether you're looking for a detailed explanation of a complex topic, brainstorming ideas for your next project, or seeking a simplified breakdown of a sophisticated concept. The way you pose your requests is also crucial.

Be Specific: The more detailed you are, the more tailored and relevant the responses will be.

Syntax, syntax, syntax: AIs need clear, grammatically correct syntax to understand the context and nuances of your request.

Seek clarification: Identify any possible ambiguities in your original question if your AI gives a response that isn't quite what you were looking for.

Ask open-ended questions: Set questions that provoke a speculative, futuristic responses.

Use multi-turn Conversations: AIs can maintain context over a multi-turn conversations. This means you can ask follow-up questions or explore topics without having to re-establish context.

Set the Tone: The tone of language you set in your questions will be reflected in its responses. Example, "explain it to me as if I am five years old."

Apply alternative perspectives: AIs can generate responses from different viewpoints – for example, ask for pros and cons.

Define the level of detail: Models can respond with various levels of detail. Be clear as to whether you want a brief summary or a detailed response.

Ask for Guidance: Models provide step-by-step instructions for example creating recipes or instructions.

Iterate and re-iterate: Experiment with different approaches and restructuring in your queries. These are versatile tools that can handle a wide range of requests. Try rephrasing your question, providing more context, or asking in a different way.

Bias

One primary key issue of concern for users is bias [17,18]. Language generation models are trained on large libraries of existing documents, meaning that any biases that exists in the training data is reflected in the generated text. This can lead to the generation of discriminatory or offensive text, perpetuating harmful stereotypes. For example, if a model is trained on a dataset that contains a disproportionate amount of text written by men, it will unsurprisingly create documents with a male-centric perspective. If a model is trained on a dataset that contains 'fake news,' it will produce consistently inaccurate text [19]. Therefore, editorial measures to prevent bias must be implemented retrospectively. The initial development stage for GAIL models consisted of scraping hundreds of billions of words from the internet with little attention given to filtering out toxic themes and bias. It is very difficult for a deployed model to correct biased outputs once it has been trained. Ironically, any attempts to improve data by limiting sources that the AI is incorporating is, in fact, equally likely to produce their own set of biases [20].

An Interview with our Managing Director

Q **Do you see AI tool use being accepted in the regulatory arena?**

A Although these technologies use exceptionally large numbers of data arranged in non-transparent model architectures (not generally accepted parameters for for regulatory authorities), agencies such of the European Medicines Agency and the US Food and Drug Administration are already defining their use, what might be seen as the first step on the road to acceptance [21, 22].

Q **What future do you think AI has in the fields of science and medicine?**

A Following the recent popularity and success with systems like ChatGPT, gaining over 100 million users in a matter of months, adoption of AI and machine learning seems inevitable. In fact, a recent publication explored the potential uses from an innovative perspective [18]. However, although they effectively support the acquisition, transformation, analysis and interpretation of data when they are used correctly, they currently have no ability to create for themselves. All they can do is regurgitate what is already known. Their ready adoption thus has the potential to kill our natural creativity.

Q **How can we get the best out AI models?**

A AI models understand complex language and provide detailed responses. To get the best out of our interactions we need to adopt a rational approach. Early efforts with AI models can be disappointing. The best way to improve their output is to be disciplined in the way you submit your queries. If at first you don't succeed... (see Top Tips).

Q **What key conclusions can you make from your research into the use of AI in medical writing?**

A The essential factor for me is first assessing the risk of using AI in your project and for users to be transparent about how they have employed language generation models. Not only does this allow others to understand the potential limitations and biases of the generated text, it also offers the possibility of replicating the process of text generation, if needed. Further, appropriate citation of the model gives credit to the model's creators and the training data's contributors [23, 24].

Q **Have you experimented with any AI models?**

A I have explored the potential for using several AI models to create materials we use in NST for training and marketing activities. I have been disappointed in the outputs they provide (I wish we could tell the reader that this article was written using AI but sadly not). I am particular about the way concepts, data and key learning points are presented.

Q **What would motivate you to use AI models?**

A In the end, the objective behind using AI is one of productivity – trying to do more faster – not necessarily the best reason. Much medical writing time is burned by poor review processes. Perhaps the biggest benefits AIs can offer (with least risk to patients) would be to apply tools like FlowGPT, DeepL or Cogniflow, that focus on improving productivity. Perhaps we are simply approaching the problem from the wrong direction.

An Object Lesson

These tools are not recognised as legal entities and therefore not bound by the same confidentiality agreements or legal protections as actual people. As such, it is not possible to guarantee the same level of discretion and confidentiality that a trusted human partner could provide. While GAIL models are sophisticated tools that can provide helpful insights and responses, it is not inherently equipped to handle sensitive information. Sharing of any confidential information with GAIL models should be expressly forbidden. Samsung became an early example of what happens when unauthorised AI use goes wrong. Samsung employees were so heavily focused on the benefits they could gain from delegating time-consuming chip testing and presentation building to AI models, they failed to consider that inputting sensitive data into an open-source AI that would make it accessible to other users. Although the severity of the leak remains unknown, Samsung subsequently banned the use of AI by their employees.

Where does Niche stand on using GAIL models?

NST recognizes the potential benefits of using AI to improve efficiency and productivity. However, we acknowledge the importance of using AI responsibly and ethically, particularly when it comes to generating content.

Our policies provide guidelines for the responsible use of AI-generated content, emphasizing the need for recording its use, proofing, editing and fact-checking, text it produces and only using AI-generated content as a starting point, not the finished product. The most important step in the appropriate application of new technologies is a thorough assessment of any risk associated with its adoption followed by a case-by-case consideration of when it may be used.

- GAIL models have the potential to increase team productivity by providing support in tasks such as fact checking, document drafting, text editing and idea generation.

- Despite their benefits, the adoption of GAIL models raises legal, commercial and reputational risks, such as with data privacy, consumer protection and contractual obligations.

- NST mitigates risks associated with the use of GAIL models through training and policies that clearly define when and where employees are permitted to use these tools.

"Any sufficiently advanced technology is indistinguishable from magic" - Arthur C. Clarke, "Profiles of the Future: An Inquiry into the Limits of the Possible", 1962.

Have you got a company policy on the use of general AI language models? If not, why not?

Do you want to see our policy? Email our medical writing team and ask for a copy: info@niche.org.uk

And finally...

Have the initial claims of AI been exaggerated – probably [25,26]. But one thing is certain, by the time you have finished reading this article the goalposts will have moved (again) [27].

A remaining concern with GAIL models is their potential to provide misinformation in their outputs . Language generation models can generate text that is not factually accurate, which can be a concern when the generated text is used in a sensitive domain like clinical science and medicine. For example, if a model generates text that provides incorrect medical information, it could potentially harm patients [7]. Further, these models often present information in an authoritative tone of voice without the expertise to consideration the overall value of its observation. Although efficient in producing vague general knowledge, it is insufficient when generating information at the level where we would seek the advice of a specialist.

Even more pernicious is the use of 'made-up' scientific references or misinformation, which has the potential to contaminate the existing biomedical knowledgebases (at scale, as the potential for increasing the rate of publication increases [28]. To address this, service providers like Open AI is attempting to implement a watermark feature that labels content as created by software like ChatGPT [29]. These tools, like DetectGPT, have been reported to correctly determine authorship in 95% of test cases [30].

Ultimately, the question of whether we should use AI-generated text in medical writing will persist. The answer most likely lies in our ability to strike a balance between leveraging AI's potential while respecting the importance of human creativity and critical thinking, as well as considering the ethical implications. As we navigate this evolving landscape, it is crucial to maintain a thoughtful approach and prioritize the well-being of patients, the integrity of medical knowledge, and the overall advancement of healthcare practices. Only by doing so will we be able to harness the power of AI while upholding the highest standards of medical writing and patient care.

Next Steps

We created this Insider's Insight into the use of general artificial intelligence language models to share a few helpful points and learnings that we have gained following our own research. If you are interested, we would be happy to share more of our experience with you and discuss how you can get the most out of preparing your own company policy on their use.

I hope that you found our guide useful. Please contact me using the email address below if you would like to discuss support for any of our upcoming initiatives.

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