



Using artificial intelligence (AI) in research writing – guidelines for graduate students

Purpose

The purpose of this document is to provide **clear guidance** for students about how and when generative AI tools (for example, ChatGPT) can be used in graduate studies and research, as per [UNESCO recommendations](#).

Introduction

Generative artificial intelligence (AI) tools have become commonplace in many domains. These tools allow for users to supply prompts to a computer algorithm that generates automated responses based on a repository of accumulated information and data. The AI-generated responses come from an underlying probabilistic model that has been trained by data coming from public and private online data sources, as well as human input as to the usefulness of past responses. One of the early generative AI tools is OpenAI's ChatGPT, although newer tools¹ that provide similar or expanded functionalities also fall under these same guidelines.

The class of Large Language Models (LLM's) is the most widely used class of models for generative AI. LLM's provide a structured framework to quickly respond to complex user prompts with responses that are often not easily distinguished from the responses one would receive from human experts. This differentiates tools that use LLM's from other tools which provide simple, targeted suggestions to input, such as auto-correct in word processing applications.

With respect to research, generative AI tools have seen wide application in programming (both for debugging previously written code as well as generating new code from user prompts) and are now gaining traction in the scientific writing domain. Beyond more traditional language applications, they have also been used for generating other material, such as music or images.

Understanding the ethics and limitations of using generative AI in research writing

To understand where and when graduate students should utilize AI tools in their work, they must first consider why they are doing the work in the first place. At the graduate level, students are expected to not just learn things and to do things, but to learn *how* to do things and to become *experts* in the things they are doing. Equally important is the ability to critically analyze information and make decisions based on those analyses. As part of their training, graduate students need to learn and adopt good research practices to eventually produce original research.

If one uses generative AI to generate a complete abstract based off vague bullet points, or if one asks a question and uses the response as a paragraph in one's work, one would not have engaged in the research **process**; that is, one would not be able to repeat the writing process on one's own without generative AI. This would be analogous to a person trying to learn how to drive by standing on the

¹ There exists a wide range of generative AI tools other than ChatGPT, such as Research Rabbit, Consensus, Perplexity, Elicit, Quillbot, and more.

sidewalk watching another person drive a car. Not only is the person on the sidewalk still incapable of driving the car themselves, but they would also not even know if the person driving the car was doing it correctly. The person on the sidewalk is not engaged in the **process** of driving the car, only in viewing the result, a result which is difficult to understand and learn from due to their own lack of experience. Watching someone else exercise will similarly not increase one's own level of fitness. Learning to do research requires engaging and even struggling with difficult and sometimes frustrating tasks. Outsourcing these tasks to a generative AI tool can inhibit one's learning.

The increasing prevalence of generative AI tools in university settings has also led to concerns related to academic integrity. This is especially true in the context of assessment and learning outcomes, and in the creation of original research. While generative AI can be used as an intelligent assistant to save time (e.g. to improve the quality of one's writing or to gather information about a new topic), it can also lead to unintentional instances of plagiarism and cheating.

Assume that one wants to use a generative AI tool, e.g. ChatGPT, to quickly create an abstract or even to generate complete paragraphs of a research paper. AI tools produce output based on models built from existing written material and user feedback, the vast majority of which will not be specific to one's writing goal. Therefore, although the AI tools can do this sort of work, the text that is produced may suffer from several potential problems:

- **Plagiarism:** In response to a prompt, ChatGPT may inadvertently reproduce exact text from the other sources without attribution (Sun & Hoelscher, 2023). Even if it does not produce exact text from other sources, it is an open ethical question as to whether definitions of plagiarism should include text produced by AI tools that *sounds* like it was written by another person because the models are based on that person's body of work (Lund et al., 2023).
- **Falsification:** When ChatGPT does not exactly reproduce existing material, it can sometimes produce new statements that are false. For example, it may not correctly state complex facts, even though a human would immediately realize they were incorrect. In some cases, ChatGPT can even generate falsified research references, that is, plausible citations with reasonable title, author, and journal combinations for papers that do not exist (Buriak et al., 2023; Sun & Hoelscher, 2023; Zheng & Zhan, 2023).
- **Wrong target audience:** If generative AI is not used properly (and even sometimes when it is), it may generate text that is correct but not appropriate for the target audience or the genre in which one is working. In other words, the language may be too colloquial for an expert reader or too formal and technical for a lay reader. The generated text may contain words or phrases that are not used by members of the community that one is addressing. Generative AI tools often struggle with these *context* issues that are easily detected by human readers who work in the domain of your research.
- **Nonsensical results:** ChatGPT, especially when asked to produce large sections of text, can sometimes give contradictory statements or produce ridiculous statements that are perfectly grammatical, but do not make logical sense (Barrot, 2023; Sun & Hoelscher, 2023; Zheng & Zhan, 2023). Generative AI tools may also draw from online resources that are scientifically incorrect or heavily debated to produce conclusive statements.

- **Loss of voice:** If one does not write the text, one’s personal message and voice will be lost. The less the text sounds like the writer, the less ownership the writer has over the ideas and sentiments communicated to the reader. Most research on AI-generated text refers to a lack of originality in much of the produced work, particularly when ChatGPT is given broad instructions or a large body of text to write at once (Buriak et al., 2023).
- **Ethical violations:** The generative AI tools generate text based on a wide variety of sources which are unknown, and it cannot make users aware of the specific source. They may use information that is supposed to be private (especially if that information was irresponsibly or inadvertently entered as a prompt by another user). Without appropriate sourcing, one may be complicit in and even exacerbate violations of privacy or intellectual property rights.
- **Breach of privacy:** All materials incorporated into generative AI tools that are uploaded to the Cloud may be used for training purposes of generative AI tools. Research findings, formulas, participant data, and other sensitive or confidential information are mostly unprotected.
- **Implicit bias:** Generative AI draws from online data that might inherently reflect societal biases and prejudices towards marginalized groups. This bias may be reflected in the content of prompt responses, produced images, etc. (MIT Sloan Teaching & Learning Technologies, n.d.).

Users of generative AI should be aware of the above limitations, as well as additional restrictions from real-world entities. For instance, some journals have outlawed the submission of any text that is predominantly AI-generated. Similarly, McGill requires that students submit only their own work: any content submitted that is completely generated by generative AI clearly violates the [McGill Code of Student Conduct](#). However, even work that is not completely generated, but is partially derived from generative AI, could also result in potential violations. Furthermore, users may also want to consider the harmful impacts of generative AI on the environment.

We encourage supervisors to set clear expectations of how generative AI will be used in research by students.

- Being accountable and transparent about your work
- Investigating when using generative AI is appropriate
 - Conducting research with academic integrity
- Reflecting on when/why generative AI is being used, and refraining from using it to replace learning

Students’ responsibilities related to the use of generative AI tools for research

Evaluating the potential benefits and risks of certain generative AI usage in graduate studies

Graduate students **can** use AI to help them engage more efficiently in the **process** of learning how to do research, when used wisely. Below, the different uses of generative AI have been divided into three

categories: low-to-moderate risk, moderate-to-high risk, and very high risk (possibly in violation of McGill regulations). The examples listed in the low-to-moderate risk category constitute uses of generative AI in graduate studies that focus on using the tool as an aid in doing the work rather than to eliminate important steps of the process. The moderate-to-high risk category calls for additional prudence and requires careful consideration of implications, while the very high-risk category covers use of AI that is not permissible. Simply put, the low-to-moderate examples *support* the work the student is already doing (e.g. by improving the quality of writing), whereas the others end up *producing* work the student is expected to do themselves. Generative AI should not be used to replace that work and in those situations, it will prevent learning, rather than support the learning process.

Low-to-moderate risk: using generative AI as a tool

Definition: Using generative AI for proofreading and editing existing text (one's own work) is generally accepted. This can be particularly helpful for students whose first language is not English. In these instances, the tool is used to improve text, not produce it. Generative AI tools can also be helpful as search engines when looking for existing literature on a given topic. However, remember to verify any references, as some may not be accurate or even exist.

Examples of the use of generative AI in this category include:

- Proofreading: Spell check, grammar check
- Editing: Lightly rephrasing objectives in grant writing or tightening language in a draft paragraph, while remaining cautious of not losing one's voice
- Translation: translation of existing text to another language (e.g. translating one's English abstract into French). The permissibility of this use is dependent on the field of study and the purpose of the translation
- Programming: Debugging existing code
- Search engines: Using generative AI to sift through and identify relevant research articles for a project
- References: Formatting the reference list

Moderate-to-high risk: using generative AI to generate content for one's own use

Definition: Using generative AI to generate content, even if restricted to one's own use, means producing something new. The student is responsible for the use of that content even if they don't claim it as their own and use it only for their own reference. It is worth noting that content produced by generative AI may generate falsified information or produce false references. When generating images and sounds, parts of or entire existing images or sound files may be reproduced exactly in ways that would be impossible to appropriately reference or provide sources for. Therefore, students can generate these for their own personal use but should be very wary of sharing them with others or including them in submitted or published work.

Examples of the use of generative AI in this category include:

- Learning: Using generative AI to break down complex topics or processes, for one's learning purposes
- Literature review: Producing summaries of published research on a given topic for one's own consumption

- Programming: Writing programs or generating code for one's own use that will not be distributed widely
- Research writing (grants, papers, publications): Generating suggestions for potential reviewers (suggested names may not be the most relevant for a given topic)
- Research design: Suggesting additional steps/tasks for experimental design (e.g. using generative AI to identify steps for one to consider, adapt and/or modify)

Very high risk: using generative AI to generate content and presenting it as one's own work

Definition: Using generative AI to generate content and presenting it as one's own work constitutes plagiarism, in violation of the [Code of Student Conduct](#). Work submitted by students for evaluation is expected to be their original work unless clearly indicated otherwise. Content generated by AI does not constitute original work.

Examples of the use of generative AI in this category include:

- Literature review: Submitting summaries of published research on a given topic as one's own work
- Programming: Sharing entire programs or large amounts of code produced by generative AI without proper attribution
- Research design/writing: Generating objectives, arguments, perspectives, research ideas, figures/images, etc.
- Research design/writing: Conducting full analyses on a data set
- Research writing: Writing entire sections or the entire proposal/paper
- Research writing: Generating research quotations

Conclusion

Generative AI frameworks can be powerful tools which can increase the quality of one's research writing. Strong arguments have been made that prompt engineering will become an important research skill. By using specific prompts and instructions, generative AI tools can detect errors and provide suggestions for even subtle improvements. However, using generative AI tools to create new text can be problematic, and any output from these tools should be thoroughly vetted to identify possible issues such as plagiarism, falsification or other negative implications of using AI-generated materials in one's work. In the end, at McGill, we want our students to learn to drive the car and not to simply stand watching on the sidewalk.

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