

Guidance Note

Using Generative Artificial Intelligence in Research

October 2023

Generative AI (Artificial Intelligence, Large Language Models) offers the unprecedented ability to manipulate and generate text and media in response to arbitrary instructions. These new capabilities offer opportunities and risks to researchers. This document will discuss responsible use, risk mitigation, and appropriate use of these tools. The technological landscape changes quickly and new tools are released almost weekly – this guide offers general advice which should be applied thoughtfully.

Regardless of any tools or technologies used, now or in the future, everyone at Macquarie University is responsible for ensuring their research meets the expectations of the [Australian Code for the Responsible Conduct of Research](#) and the [Macquarie University Code for the Responsible Conduct of Research \(2018\)](#).

Generative AI must be used with caution, and its use is currently inappropriate in some research processes because Generative AI services, including ChatGPT:

- cannot meet the requirements for authorship
- can create authoritative-sounding outputs that may be incorrect, incomplete, or biased
- could inappropriately capture sensitive data (including, but not limited, to personal information).

Researchers **must not** use Generative AI:

- to perform peer review activities
- to generate substantive content of research outputs, including HDR theses
- for writing the critical components of human ethics, animal ethics, or biosafety applications.

Researchers must exercise care in the use of Generative AI in other aspects of their research and should:

- i. only do so with the written agreement of their research collaborators (& HDR supervisors)
- ii. review and consider the terms of service/license of the platforms used and any models used
- iii. consider the current issues and understandings around copyright and intellectual property
- iv. mitigate risks around the insecure storage or unauthorised re-use of sensitive data
- v. exert oversight and control when using the technology
- vi. carefully and critically review the output and results created by Generative AI
- vii. take responsibility for the integrity of the content altered or created using Generative AI
- viii. disclose the use of Generative AI to potential publishers and in disseminated research outputs
- ix. read and follow the policies of publishers and funders regarding the use of Generative AI.

Which University Policies are Relevant to the use of Generative AI in research?

[Authorship Policy](#)

[Cyber Security Policy](#)

[Macquarie University Code for the Responsible Conduct of Research \(2018\)](#)

[Macquarie University Research Code Complaints, Breaches and Investigation Procedure](#)

[Higher Degree Research Supervision Policy](#)

[Higher Degree Research Thesis Preparation, Submission and Examination Policy](#)

[Peer Review Standard](#)

[Research Data Management Policy](#)

This Guidance Note summarises some current constraints that Macquarie University researchers need to be aware of when employing **Generative AI, Large Language Models (LLMs), or Foundation Models**.¹ It is intended for researchers and research students; undergraduate and postgraduate coursework students should refer to the [AI Tools at Macquarie University](#) for further guidance.

Generative AI (Artificial Intelligence) uses machine learning approaches trained on large data sets to manipulate and create content—including text, audio, and other media—in response to users’ instructions, called “prompts”. The use of Machine Learning or Generative AI provides new opportunities for research, software development, data analysis, and a powerful tool for research writing. For many it could become a regularly used tool. However, using Generative AI also entails risks for the researcher, their research, and data integrity.

Macquarie University researchers, research students, and research staff are responsible for ensuring their research meets the expectations of the [Australian Code for the Responsible Conduct of Research](#) and the [Macquarie University Code for the Responsible Conduct of Research \(2018\)](#) (*Macquarie University Research Code*).

The use of Generative AI is inappropriate in some research applications and scenarios, and special care is required when using Generative AIs in all other research process.

Researchers need to be aware of the terms of use of Generative AI services, as they contain important clauses related to data sources, privacy, and responsibility of use.²

Researchers must ensure that their research outputs are their own work. Researchers are required to cite others’ work appropriately. Because it isn’t possible to hold these tools responsible for their content, they cannot be cited, but their use must be acknowledged and disclosed.

WHAT IS GENERATIVE AI?

Generative AI is a technology which uses statistical approaches (part of the Machine Learning discipline) trained on very large corpora, to simulate the ability to follow complex instructions. These instructions are called “prompts”. A prompt to a Generative AI can be used to chat, generate text, edit or rephrase text, transcribe audio, analyse existing data, or even assist in the automation of processes. This type of AI is often used to perform a limited range of tasks to solve a defined issue.³ Services offering Generative AI use large statistical models called Foundation Models⁴ to accomplish these tasks. Models specialised in text processing are called Large Language Models (LLM/LLMs) because they are trained on very large corpora⁵ (including terabytes of pirated books⁶, Wikipedia articles, stack overflow posts, and exchanges on reddit). There are also models trained on audio, multi-lingual translation, images, and video.

Generative AI services generate outputs in response to user “prompts”. One example is an LLM trained to mimic chat-like behaviour (e.g., ChatGPT), which produces text in direct response to user prompts. Another example is GitHub Copilot, which was trained on public and open-source code and comments to support programmers in writing and debugging code.

¹ A foundation model is a single Machine Learning Neural Network trained on a huge amount of data, adaptable to many applications. A Large Language Model (LLM) is a foundation model trained on very large corpora of texts. Generative AI is the popular name for a service, built on LLMs or foundation models, which can create outputs (e.g., text, images, video, audio, code or synthetic data) from data they are trained on.

² Researchers using these services, either through a “Chat-style” interface or through an application programming interface (API), need to read and understand the essential clauses pertaining to responsibility for content and legal indemnity. For example, in their Terms of Use, Open AI asserts: “*You are responsible for Content, including for ensuring that it does not violate any applicable law or these Terms.*” (OpenAI Terms of Use March 14 2023, section 3) and “*You will defend, indemnify, and hold harmless us, our affiliates, and our personnel, from and against any claims, losses, and expenses (including attorneys’ fees) arising from or relating to your use of the Services, including your Content, products or services you develop or offer in connection with the Services, and your breach of these Terms or violation of applicable law.*” (OpenAI Terms of Use March 14 2023, Section 7a).

³ For example, the use of digital personal assistants (e.g., Alexa or Siri) or the use of AI to translate languages/generate transcriptions.

⁴ “WHAT IS A FOUNDATION MODEL? In recent years, a new successful paradigm for building AI systems has emerged: Train one model on a huge amount of data and adapt it to many applications. We call such a model a foundation model.” (<https://crfm.stanford.edu/>)

⁵ For example: “*We build and maintain an open repository of web crawl data that can be accessed and analyzed by anyone.*” (<https://commoncrawl.org/>)

⁶ <https://theconversation.com/two-authors-are-suing-openai-for-training-chatgpt-with-their-books-could-they-win-209227>

With consideration of risks specific to each task, some instances of reasonable current use of Generative AI in research involves:

- supporting software development/programming
- generating standard instructions or procedures
- transcribing or generating audio
- standardising grammar or expression
- providing a “distant reading” and summarising or consistently manipulating research data
- assisting in identifying problems in coding or formulas
- restoring low-quality images or videos
- writing summaries of available sources to begin researching a new topic.⁷

1. Engage with Generative AI responsibly



There is potential for Generative AI to support research, but **these tools cannot replace a researcher’s creativity, reasoning, judgement, and critical thinking.**

Careful and responsible use of Generative AI is required due to the risks and considerations outlined below.

1.1 ACCURACY AND INTEGRITY

Researchers are expected to apply *“Rigour in the development, undertaking and reporting of research: Underpin research by attention to detail and robust methodology, avoiding or acknowledging biases”* (Macquarie University Research Code 12.b).

The use of Generative AI in research frequently involves the collection and analysis of large amounts of data, often of unknown validity or trustworthiness. AI algorithms that form the basis of Generative AI rely on the data they are trained on. Therefore, Generative AI models may perpetuate bias if the data used in training the model is biased.⁸ Furthermore, Generative AI can create outputs that sound authoritative but are not factual.⁹

Researchers using Generative AI for research are fully and solely responsible for confabulations, errors, or omissions generated by its use, so information provided by Generative AI must always be confirmed with credible sources. A Generative AI tool is not capable of introspection or checking and validating text or its outputs.¹⁰ Researchers must therefore never use Generative AI for factual confirmation of information.

1.2 DATA PRIVACY, SOVEREIGNTY, AND SECURITY

Generative AI services may capture user data, and this can include any sensitive research data users might provide. It is essential to regularly read and review the terms of use of services being employed in research, as they may change without notice.¹¹

Making sensitive or commercial-in-confidence data available to Generative AI services creates risk due to potential data misuse or data privacy breaches. Maintaining appropriate data privacy and security measures is essential to protect sensitive or confidential information from misuse or unauthorised access.¹²

Data sovereignty and disclosure must be considered when planning the use of Machine Learning (ML) or Generative AI in research involving sensitive and/or confidential information, in much the same way that

⁷ Though researchers should *never* trust a Chatbot like ChatGPT to provide useful and correct answers based purely on its training in the absence of sources (see section 1.1).

⁸ This can include unrepresentative, incorrect or incomplete data sets, or discriminatory patterns.

⁹ A generative AI system can provide a response that is not factual, sometimes termed “AI [hallucination](#)”. See this [article](#) (and subsequent correspondence) originally written by researchers with the support of ChatGPT by OpenAI.

¹⁰ See the coverage of a Lawyer using ChatGPT to support their argument with examples of legal cases (which later came to light had been entirely invented by ChatGPT): “*When the lawyer was asked to provide copies of the cases in question, they turned to ChatGPT for help again—and it invented full details of those cases, which they duly screenshotted and copied into their legal filings. At some point, they asked ChatGPT to confirm that the cases were real... and ChatGPT said that they were. They included screenshots of this in another filing. The judge is furious.*” (<https://simonwillison.net/2023/May/27/lawyer-chatgpt/>)

¹¹ Terms of use of an Application Program Interface (API) and various products are likely different than their chat-style interfaces.

¹² Following the Macquarie University [Research Data Management Policy](#) and [Cyber Security Policy](#). Consider, for example, if running your own open-sourced foundation model/LLM (i.e., LLaMa or Stable Diffusion) on local or national compute infrastructure is an appropriate risk mitigation strategy.

the use of other data-handling infrastructure is carefully considered in terms of legislative and privacy requirements.

1.3 COPYRIGHT AND INTELLECTUAL PROPERTY

Caution is advised in the use of Generative AI when commercial-in-confidence information or intellectual property might be divulged to the model via prompts or other means. AI is yet to be directly regulated. For copyright to subsist in a work, it needs to originate from a human author who exerted intellectual effort.¹³ Thus, it is unclear whether copyright protects material created by Generative AI. Indeed, several corporations responsible for the development of foundation models, such as Stability AI, OpenAI, and Meta, have been subject to legal challenges for copyright infringement relating to the use of public materials to train AI.¹⁴ This means that users may also be infringing copyright themselves by using Generative AI tools.¹⁵ In addition, Australian Copyright law only allows attribution as an author to be given to *humans* rather than AI. There may also be different copyright consequences around the use of generated text versus images.¹⁶

2. Avoid use of Generative AI in some circumstances



In some research processes, the use of Generative AI is inappropriate. There are also some Generative AI services deemed inappropriate for *any* research use due to unacceptable risk.¹⁷

2.1 GENERATIVE AI CANNOT BE ASSIGNED AUTHORSHIP

Researchers must “*Ensure that authors of research outputs are all those, and only those, who have made a significant intellectual or scholarly contribution to the research and its output, and that they agree to be listed as an author.*” (Macquarie University Research Code 13.12).

Research outputs must be the work of the researchers themselves. Generative AI cannot meet the threshold for attribution of authorship as per the *Macquarie University Authorship Policy cl.10 (and in line with publishers’ policies)*.

Any researcher using the material produced by Generative AI and claiming it as their own creation without acknowledgment would be in breach of the *Macquarie University Research Code* and in some cases would also be in breach of publishers’ policies and the platforms’ terms of service (see section 3.1).

2.2 HUMAN ETHICS, ANIMAL ETHICS, AND BIOSAFETY APPLICATIONS

Researchers are expected to “*Comply with relevant laws, regulations, disciplinary standards, ethics guidelines and institutional policies related to responsible research conduct*” (Macquarie University Research Code 13.4).

All applications to a Human Research Ethics Committee (including sub-committees), an Institutional Biosafety Committee, and the Animal Ethics Committee must be written by the researchers and applicants themselves. Generative AI must not be used to draft these applications in full. While Generative AI can assist in creating a “first draft”, editing, or rewriting for different audiences, the LLMs cannot understand the research purpose, nor can they accurately articulate or be responsible for risks to participants, animals

¹³ *Telstra Corp Ltd v Phone Directories Co Pty Ltd* (2010) 194 FCR 142: The Federal Court held that a work is not original if it is computer generated and not the result of human authorship. Further, it was held that humans needed to exert independent intellectual effort into the creation of the work.

¹⁴ See, for example, several articles in [the Conversation](#) and “[The Complex World of Style, Copyright and Generative AI](#)” [blog post](#).

¹⁵ For example, OpenAI states: “OpenAI hereby assigns to you all its right, title and interest in and to Output” (OpenAI Terms of Use March 14 2023, section 3). If ChatGPT provides text that is protected by copyright and the user copies that text into their research, the user would be infringing copyright, since they are using copyrighted material without permission from the copyright owner.

¹⁶ For example, *Nature* allows (with acknowledgement) LLM-generated text as a first draft. However, it forbids the use of LLM-generated image and video, due to specific copyright concerns around its training corpora and generation of imitative images. (<https://www.nature.com/articles/d41586-023-01546-4>)

¹⁷ For example, Meta/Facebook hosted products like Snapchat’s “My AI” must not be used, regardless of their license status, due to Meta’s repeated scandals. In contrast, Meta/Facebook’s open-source tools, like LLaMa, which are licensed as open-source products and which can be run on local or national research compute infrastructure, may be considered as an option.

or researchers' wellbeing, welfare, or safety, which are a researcher's responsibilities.¹⁸ The use of these tools in Ethics or Biosafety applications risks delay, mistakes or misunderstandings, and a complicated revision process if confabulations or errors are included in the submission. However, these tools have demonstrated capabilities in *rewriting* text and could be used—with caution—for some associated documents or processes. For example, where the application or informed consent form calls for plain-text descriptions of the research, researchers may use services incorporating GPT-4 (or similar) to explore alternative drafts. In these circumstances, researchers must acknowledge their use (see section 3.1) and be mindful of oversimplification, confabulation, and misrepresentation (see section 1.1). As these tools increasingly become integrated into browsers and word processing software, this rule is intended to avoid their use in the wholesale generation of an ethics application, rather than their use in editing and proofreading.

2.3 STUDENTS' USE OF GENERATIVE AI FOR RESEARCH THESES

Research students must ensure their thesis is their own work and must demonstrate originality, the exercise of independent critical thought, and/or the production of justified empirical outcomes or analytical evaluations in research, appropriate to their degree.¹⁹

Generative AI, LLMs, and tools integrating these models will likely become part of the writing, research, and composition process for many researchers and students. However, Higher Degree Research (HDR) and Honours students must be responsible, from start to finish, for their research. Students submitting research, like all researchers at Macquarie University, are **fully** responsible for the accuracy and integrity of their work.

Presenting content created by Generative AI as a research student's own work constitutes a breach of the *Macquarie University Research Code*. Commercially available solutions for detecting plagiarism, including iThenticate or Turnitin, both of which have been used at Macquarie University, have publicised rapid updates to their AI writing detection capability.²⁰ However, such statistical tools for "AI Detection" should be used with caution.²¹ At Macquarie University, it is recommended that *all* stages of a students' research journey be well documented—both for data integrity purposes²² and to serve as evidence of originality and intellectual input if challenged.²³

The use of Generative AI to wholly generate a research output is prohibited. Text-based Generative AI tools such as ChatGPT fall within the broad definition of contract cheating services according to the TEQSA Act 2011 (Cth), s5. It is, however, acceptable to use these tools for ideation of a "first draft", as one part of a more sophisticated editing strategy, or to help mitigate the challenges of English as a second language.

Student research is acceptable where the LLMs or Generative AI is the topic of research, rather than the mechanism by which the research is documented, but note the limitations and considerations outlined elsewhere in this document.

HDR Supervisors are expected to "*Provide guidance and mentorship on responsible research conduct to other researchers or research trainees under their supervision and, where appropriate, monitor their conduct.*" (Macquarie University Research Code 13.2).

Supervisors should have iterative exposure to their students' work across their entire research degree and ensure their research progression (including critical judgment or originality) is observed and well-documented. Supervisors must closely monitor the use of Generative AI by their research students.²⁴ Generative AI should not be used without supervisory approval, and where these tools are used in any capacity by research students or supervisors, they must be acknowledged (see section 3.1).

¹⁸ Including, but not limited, to the [National Statement on Ethical Conduct in Human Research](#), the [Australian code for the care and use of animals for scientific purpose](#), or the [Gene Technology Act 2000](#).

¹⁹ As per the [HDR Thesis Preparation, Submission and Examination Policy](#), cl. 3–5.

²⁰ Improved tools could be used in the future to retrospectively evaluate the use of Generative AI in theses. For example, see *Checker AI*, formerly AICheatCheck, with [EduLink](#).

²¹ The use of statistical tools like Turnitin's "AI Detection" services may cause false and/or discriminatory claims against student work, and such approaches should not be solely relied on to explore the originality of research.

²² Including for backups and disaster recovery following the [Research Data Management Policy](#).

²³ In case of a claim by a third party about "AI Generated content", because these "AI detection tools" use statistical claims, any appeals against third-party claims should involve timestamped evidence of student work to show originality and research progression.

²⁴ Following the [Higher Degree Research \(HDR\) supervision Policy](#) & the [HDR Thesis Preparation, Submission and Examination Policy](#).

2.4 DO NOT USE GENERATIVE AI FOR PEER REVIEW

Researchers are expected to “*Participate in peer review in a way that is fair, rigorous and timely and maintains the confidentiality of the content.*” (Macquarie University Research Code 13.15).

The use of Generative AI by peer reviewers may compromise the integrity of the peer review process and be in breach of the [Australian Research Code](#) & [Macquarie University Peer Review Standard](#).

Consistent with the policies of the [National Health and Medical Research Council \(NHMRC\)](#) and the [Australian Research Council](#), peer reviewers must not input any part of a grant application, or any information from a grant application, into a Generative AI service. Entering confidential application information into a remotely hosted Generative AI service breaches confidentiality requirements and obligations.²⁵

3. Adapt & attribute the use of Generative AI in research



The awareness and use of Generative AI in research is rapidly evolving, as are the policies of funders and publishers guiding its use.

Researchers must comply with the policies of Macquarie University, publishers, and service providers. Researchers are encouraged to develop digital and AI literacy skills where appropriate,²⁶ in line with the potential use and implications of Generative AI to their field of study.

3.1 ATTRIBUTION FOR THE USE OF GENERATIVE AI

All researchers, research students, and research staff are expected to transparently document and report their research methodology, data, and findings as outlined in the *Macquarie University Research Code*. This includes reporting the use of Generative AI technology or tools in the research.

Most journals and publishers currently require disclosure of the use of Generative AI models in research. Current requirements²⁷ include careful logging (transcription) of all uses of these services, to be attached as supplemental material or appendices to research outputs. Journal editors, peer reviewers, and other researchers may want to review the influence of these services on the final product.

The use of hosted services may also include obligations for acknowledgement or attribution.²⁸ Researchers must comply with the policies of the publishers and service providers—whichever is stricter. Using the output from Generative AI without appropriate disclosure may constitute a breach of the *Macquarie University Research Code*.

²⁵ For example, with peer review activity undertaken for the [NHMRC](#), reviewers are bound by the provisions of the Privacy Act 1988 in its collection and use of personal information and by the commercial confidentiality requirements set forth by funding agencies (e.g. under section 80 of the National Health and Medical Research Council Act 1992). Peer reviewers are to treat applications in confidence and must not disclose any matter regarding applications under review. As part of this process, peer reviewers are often required to complete a Deed of Confidentiality.

²⁶ All Researchers, but especially Research Supervisors, are encouraged to learn more about Generative AI tools and support others in their appropriate use.

²⁷ <https://www.nature.com/nature-portfolio/editorial-policies/ai> says as of 29 August 2023: “Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript.”

²⁸ For example, OpenAI’s sharing and publication policy requires: “Content co-authored with the OpenAI API, Creators who wish to publish their first-party written content (e.g., a book, compendium of short stories) created in part with the OpenAI API are permitted to do so under the following conditions: The published content is attributed to your name or company. The role of AI in formulating the content is clearly disclosed in a way that no reader could possibly miss, and that a typical reader would find sufficiently easy to understand.” They recommend the use of the following stock language: “The author generated this text in part with [GPT-3, OpenAI’s large-scale language-generation model, edit as appropriate]. Upon generating draft language, the author reviewed, edited, and revised the language to their own liking and takes ultimate responsibility for the content of this publication.” (<https://openai.com/policies/sharing-publication-policy>)

3.2 USE OF GENERATIVE AI IN GRANT APPLICATIONS

In line with policies of the [National Health and Medical Research Council](#) and the [Australian Research Council](#), applicants are to exercise caution when using Generative AI services in the preparation of grant applications, for many of the same reasons provided above.

When submitting a grant, both applicants and the University are required to certify that all information provided is accurate. Applicants are accountable for any misinformation and factual errors more broadly, including those resulting from the use of Generative AI.

3.3 MITIGATING THE RISKS OF GENERATIVE AI USE

Researchers must carefully plan the management of research data in any project involving Generative AI.

A Data Management Plan²⁹ (DMP) for each project (including where required, the online DMP in FoRA accompanying a funding application or an application to a Human Research Ethics Committee) must detail the intended use of Generative AI services, ML, and foundation/LLMs to analyse research data and outline how research data itself will be used in relation to the model. Adequate safeguards must be specified in the application to ensure that data used with these tools are protected from unauthorised disclosure, inclusion in training data, and prevention of unauthorised sharing/access.

Please refer to the [online resources](#) regarding research data management when using Generative AI and [consult](#) with the research data management team if there is any doubt about the suitability of a specific service for a task involving research data.

3.4 LEARN MORE

The [Elements of AI](#) is a series of free online courses created by MinnaLearn and the University of Helsinki to help others learn what AI is, what it can and cannot do, and how it can be used.

Deakin University's [LibGuide on using generative AI](#) provides a starting summary of some of the common types of Generative AI and their limitations, as well as guidelines for ethical use and suggestions for getting started.

Subscribe to newsletters or blogs such as [The Conversation](#) or [OpenAI's blog](#), [Simon Willison's Blog](#), [OneUsefulThing](#), or Zvi Mowshowitz's [AI Updates](#) to stay abreast of Generative AI-related news and developments.

3.5 REPORTING CONCERNS ABOUT THE USE OF GENERATIVE AI

Concerns about a Macquarie University researcher using Generative AI inappropriately can be discussed in the first instance with a [Research Integrity Advisor](#). Where necessary, concerns will be managed following the [Macquarie University Research Code Complaints, Breaches and Investigation Procedure](#).

²⁹ A [Data Management Plan](#) (DMP) outlines how a researcher plans to manage the data collected and/or generated during the course of a research project and includes a summary of any risks to data or privacy and how the risks will be mitigated.