**Eﬀective and Responsible Use of AI in Performing Graduate Research/Scholarship/Creative Activities and in Writing Dissertations, Theses, and Manuscripts for Publications**

The use of artiﬁcial intelligence has expanded greatly in recent years in all sectors of society. Generative AI and Large Language Models, like [ChatGPT](https://openai.com/index/chatgpt/)®, [Microsoft Co-Pilot](https://copilot.microsoft.com/)®, [Google Gemini](https://gemini.google.com/?utm_source=google&utm_medium=cpc&utm_campaign=2024enUS_gemfeb&gad_source=1&gclid=EAIaIQobChMI3KDYzcKchwMV2Ub_AR3MFwXKEAAYASAAEgI75vD_BwE&hl=en)®, [GitHub Copilot](https://github.com/features/copilot/)® and [Stable Diffusion](https://stablediffusionweb.com/)® are rapidly becoming available, expanding access to this technology for use by anyone who is digitally literate.

These tools can often be used eﬀectively in conducting research/scholarship, and in the production of creative works, though there are different disciplinary expectations and caveats which might apply. In some fields, substantive generative AI assistance is / would be considered plagiarism, at worst, or viewed as poor scholarship at best. One should be mindful to use AI only after careful consultation with faculty, and colleagues across the disciplinary field; it may be necessary to be cognizant of industry standards, as well.

Best practice suggests that mentors and research supervisors will have regular and continuing conversations with mentees and other students/trainees about the allowed or intended use of generative AI in their research/creative activities programs.

The questions presented below are meant to guide departmental and program consideration only. Any resulting guidance developed at the faculty, departmental and program level would be expected to evolve with the rapidly changing landscape of AI[[1]](#footnote-1), and should be tailored to align with accepted practices within specific disciplines.[[2]](#footnote-2):

* How [if at all] can students use AI, and use it eﬀectively, as a tool to help generate research ideas and approaches? How [if at all] can students use AI, and use it effectively, as a tool to help generate scholarship and/or creative arts ideas and approaches?
  + How accurate are the results from an AI source?
  + How conﬁdential is the process? Is a student giving away valuable ideas or research results to an open platform (like ChatGPT) before the topic is peer reviewed and published? Will you lose your intellectual property rights, such as patents?
  + How can students improve their skills in using AI as a tool in research?
* How [if at all] can students use AI, and use it eﬀectively, as a writing or editing tool for publications and their thesis, or to produce creative works?
  + Are students at risk of committing research misconduct in the form of plagiarism, and/ or at risk of conflicting with disciplinary norms/standards/expectations, if they use a generative AI platform to write parts of their thesis or in the production of creative works?
  + How can students (and other researchers) transparently indicate within their written works/creative products the contribution of generative AI or other assistive technologies?
  + What restrictions do professional societies and publishers place on the use of AI in publications and in reviewing papers or proposals?

**Overview of Generative AI**

Generative AI models learn how to imitate the forms of the data they were trained on. They do this by “learning” mathematical relationships between input data (for instance, previous words in a sentence) and outputs (like the rest of the sentence) to be able to generate future examples (text) that mimic the properties of the (massive amounts of) data they were trained on. The learning mechanism tries not just to memorize the data but produce a more generalized input-output mapping that captures the essence of the data.

Available systems differ in the internal mathematical transformations used to map inputs to outputs, and – more critically – on the data on which they were trained. Portions of a trained model can sometimes be used as a subcomponent of another model, or as the starting point for training other models for more specific tasks. In this way the information gleaned from one set of data can be passed along to other AI systems without sharing the data itself.

For systems that do not deal directly with text (but rather computer code or images, for example), the methods are much the same but work with quantitative representations of objects rather than words.

**Strengths of Generative AI:**

* It can sort through a large amount of information quickly to synthesize content from that information.
* It is good at summarizing existing information that is freely available and not behind ﬁrewalls or paywalls and is neither too old nor too recent. For example, it can summarize existing methodologies in a particular research area or positions on a topic.
* It can be a good editor; in that it may help improve the legibility of text written by non-native speakers.

**Challenges for AI:**

* Current algorithms are good at summarizing but maybe not necessarily/entirely good at generating accurate and dependable new[[3]](#footnote-3) or creative ideas.
* The quality of the output depends both on the algorithmic approach and the quality of the training data. Though the content generated may sound very plausible, it may be inaccurate such as including non-existent publications or incorrect citations of publications. There are many companies that provide generative AI platforms, and the quality is mixed.
* Since information gleaned from one set of data can be passed along to other AI systems without sharing the data itself, this can lead to more difficult providence issues.
* People are prone to biases in their work, and AI can pick up those biases from the training data and even amplify them.
* Conﬁdentiality or security of data voluntarily input to a Large Language Model by users depends on the policies and practices of the company that owns that platform. For preciseness, one should access the terms of use outside of the AI platform, rather than prompt the AI platform for these terms. For your own security and conﬁdentiality of your data, it is more prudent to assume that whatever is fed into a query is owned by that company.

**Act ethically:**

The responsible conduct of research includes a number of practices that should be considered when using AI to assist in performing research:

* Authorship: Only include material in your writing that you or a co-author wrote or that you can cite from primary sources. Note also that there is no guarantee that an AI-generated response is not including passages verbatim from other sources, so quoting an AI-generated response may crossover to traditional plagiarism.
* Falsiﬁcation or fabrication of data: There is no guarantee that Generative AI will produce accurate results or that it will not create new false data.
* Responsible collection and management of data: There are rules/regulations/laws regarding data privacy/confidentiality [HIPAA, FERPA, 28 CFR 46]; you should take all necessary and appropriate steps to ensure that uploading sensitive data to an AI platform is consistent with applicable laws/regulations [there's room also to reference the question of whether use of AI generated content is ever ethical by bringing up awareness of whether authors of the training data opted in, etc].
* Awareness of the tools you're using: make sure you're aware of its terms of service, where it obtained its data, and how it will use the information you put into it.
* Guidance and/or expectations re the appropriate use of generative AI will likely vary depending on the source [journals, funding agencies], as well as evolve over time, and it is your responsibility to be aware of these different and/or changing expectations.

**It is recommended that faculty and students visit the UCR AI website (**[**https://its.ucr.edu/ai**](https://its.ucr.edu/ai)**) to learn about up-to-date information on the availability of AI tools, data privacy considerations and training resources.**

# ***We expect that all material from here to the conclusion be rewritten/edited by departments/programs to take into account disciplinary differences/expectations/allowances. The material presented in these sections is offered simply for consideration as a starting point for conversations with colleagues and students, and/or as illustration, with some key resources and citations included for assistance. Please see Juliette Levy's (Dept of History) example below [page 17] for ways to make specific to departmental concerns.***

# **Considerations for departments/programs in developing discipline/practice specific guidance for their graduate students**

Creating new knowledge and performing research is at the highest level of the educational experience of students. Novice researchers must learn essential critical thinking skills needed in formulating a research idea, determining appropriate methods and approaches for the research plan, collecting data, summarizing results, and drawing conclusions. AI can be a valuable tool for assistance but is not an accountable entity for the research outcomes since the ultimate responsibility of research lies with the human.

Thoughts re how students can use AI eﬀectively as a tool to help generate research, scholarship and/or creative arts ideas and approaches. **Please qualify/edit/add/delete as needed / useful for your discipline**:

* Brainstorming: You can use the AI tool as a brainstorming partner, where you exchange ideas whether the AI prompts you or you prompt the AI for ideas. Brainstorming is an iterative process that can be made more eﬀective with the way that the queries are posted. For more samples or information, post this query: “How can I use AI to help me to brainstorm an idea?”
* Surveying Existing Approaches: Large Language Models, if trained broadly in a topic, can give a good initial overview of existing approaches or existing literature on a topic. Current research sources such as library or professional society databases are more reliable in terms of accuracy of peer-reviewed content. See the [Rutgers University Library site](https://libguides.rutgers.edu/artificial-intelligence/ai-in-research) for guidance and AI platforms for searching research databases.
* Prompt engineering is important: Practice the prompts used for Generative AI. The value of the response depends on the value of the prompt. If you provide a low quality or vague prompt, you will get vague results. Critical thinking skills are enhanced by learning how to iterate on the prompts to reﬁne results or to use the material gathered from one result to identify new avenues of inquiry to pursue. Varying skill levels among users might exacerbate existing inequalities among students. For example, students for whom English is the second language might be at a disadvantage. Examples of strategies for prompt engineering are found in the [OpenAI Guide](https://platform.openai.com/docs/guides/prompt-engineering/six-strategies-for-getting-better-results) and in [Ivan Allen article on prompt engineering.](https://iac.gatech.edu/featured-news/2024/02/AI-prompt-engineering-ChatGPT)
* Using AI to support data analysis: In many fields, analyzing the data collected from one’s research project is a critical step in the research process. Quantitative data analysis in these fields is often conducted using programming environments such as R or Matlab, which requires one to write a script for the program to carry out the various steps in your analysis. While you should generate your own script to carry out your analysis, Generative AI can be helpful for troubleshooting errors.

**Considerations re Usage:**

* Be very skeptical of the results. Do not trust any outputs that you cannot evaluate yourself or trace back to original credible sources. There are many stories of generative AI giving citations of articles that do not exist (see the article in the Chronicles of Higher Education referenced below).
* Be scientific with your prompts (or queries): Prompting is not deterministic, so the same prompt at a different time may result in a different response. Small changes in the wording of the prompt may yield very different responses. Keep records, make small changes and see how it affects the outcome, etc.
* Don’t share any data or information that is confidential, proprietary, or have IP implications. Your uploaded data or ideas might be incorporated into the learning model to be available for others in your research area, prior to you having a chance to publish it. If you intend to pursue commercialization or other Intellectual Property avenues for your work, putting the information into an open AI platform may be considered as disclosure.
* Is it ever ok to use an AI source in brainstorming or otherwise to help generate research ideas? How does this compare to brainstorming ideas with human collaborators? Consider, for example, brainstorming done among human colleagues that results in research that is published. The contribution of the collaborators, if substantial, may result in an acknowledgement in the manuscript or authorship attribution. AI brainstorming can be treated similarly, **to an extent**. An AI session that resulted in novel ideas may be recognized in the published work, but an authorship attribution is not warranted; the sampling of guidelines of authorship, given in the section on Professional Societies and Publishers below, all require that an author approve the ﬁnal manuscript and be held accountable for the content. Neither of these requirements would be possible for an AI agent to fulfill in order to receive authorship recognition.

Thoughts on how students can use AI eﬀectively as a writing or editing tool for publications and their thesis. **Please qualify/edit/add/delete as needed / useful for your discipline**:

* Editorial assistance: Using an AI platform for a grammar check and for editorial improvements is like having a person proofread a paper or essay and generally does not require acknowledgement. An example of an AI editorial tool is Grammarly. Depending on the AI platform, keep in mind that what is intended only as a grammar check may inevitably put your ideas into a system over which you don’t have control.
* Similarly, indexing software (such asTExtract) and translation software (such as Google Translate) can be useful tools to begin the indexing or translating processes, but they should not supersede human critical engagements with their analyses, evaluations, and classifications of data. As referenced above, scholars are expected to reveal their use of such AI tools in reference notes.
* Substantive Generative AI assistance:

The use of generative AI should be clearly documented when there has been [substantive] use of generative AI in a thesis/dissertation/manuscript, including tables/graphs/images/code. Otherwise, the use of AI may constitute plagiarism, which is research misconduct.

The following is from the Association for Computing Machinery, offered here as an example of an approach to disclosure/documentation of the use of AI:

· If you are using generative AI software tools such as ChatGPT, Jasper, AI-Writer, Lex, or other similar tools to generate new content such as text, images, tables, code, etc. you must disclose their use in either the acknowledgements section of the Work or elsewhere in the Work prominently. The level of disclosure should be commensurate with the proportion of new text or content generated by these tools.

· If entire sections of a Work, including tables, graphs, images, and other content were generated by one of these tools, you should disclose which sections and which tools and tool versions you used to generate those sections by preparing an Appendix or a Supplementary Material document that describes the use, including but not limited to the specific tools and versions, the text of the prompts provided as input, and any post-generation editing (such as rephrasing the generated text). Authors should also note that the amount or type of generated text allowable may vary depending on the type of the section or paper affected. For example, using such tools to generate portions of a Related Work section is fundamentally different than generating novel results or interpretations.

· If the amount of text being generated is small (limited to phrases or sentences), then it would be sufficient to add a footnote to the relevant section of the submission utilizing the system(s) and include a general disclaimer in the Acknowledgements section.

from <https://www.acm.org/publications/policies/frequently-asked-questions>

Also see new policy from COPE re AI/authorship and how /where to acknowledge the use of AI: <https://publicationethics.org/cope-position-statements/ai-author>

Please check the journals in which you regularly publish to see their guidance re use and citation of AI.

**Considerations re Usage:**

* Understand the AI policies for publications prior to submission: A professional society may have speciﬁc restrictions on the use of AI in the writing of a publication to be submitted and reviewed. Make sure that you understand and abide by those restrictions before submission. For example,
* Generally, authors are responsible for the content of their submissions, regardless of whether they used generative AI or not. So, authors would be responsible for errors in AI-generated content.
* Some publishers require full transparency and credit for the source of AI-ideas in the manuscript.
* Preserve conﬁdentiality of the information: any information that you upload into a Large Language Model may become part of that model’s data and, as a result, be used to form responses to another person’s inquiries on that topic. If your paper has not yet been submitted for peer review, then you may decide to seek AI editing help only on smaller sections of the paper that don’t contain new research content. In some cases, you may be able to opt out of your information being included in the training data.
* Don’t short circuit the learning process: For a PhD student, an important part of their learning processes is to gain skills on analyzing, summarizing, and discussing their research results. Inputting data into a generative AI platform and asking it to write this type of content has two disadvantages: it does not give the student the experience to gain those skills, and it may produce content that sounds good but would not withstand scrutiny by experts.
* Putting aside the conﬁdentiality risk mentioned above and publishers’ restrictions, hypothetically, a researcher could ask the generative AI platform to outline discussion points to gain ideas as a ﬁrst step in doing their own analysis and write-up. The researcher should be aware of the limitations and possible consequences of that action.

·

**Sample Guidance from Professional Societies, Publishers, and Funding Agencies:**

*Using AI in Reviewing Proposals and Papers:*

As a reviewer, you generally need to attest to conﬁdentiality of the information that you are to review, especially not sharing the information with others. Publishers and funding agencies are starting to put restrictions on the use of AI in the review process. For example,

“NIH prohibits NIH scientiﬁc peer reviewers from using natural language processors, large language models, or other generative Artiﬁcial Intelligence (AI) technologies for analyzing and formulating peer review critiques for grant applications and R&D contract proposals.” From [NIH](https://grants.nih.gov/grants/guide/notice-files/NOT-OD-23-149.html) [Notice Number NOT-OD-23-149](https://grants.nih.gov/grants/guide/notice-files/NOT-OD-23-149.html)

*Authorship and AI:*

Below are several links to authorship guidelines from societies and publishers. The additional guidelines on authorship listed below have a common element: an author is responsible for the content of their work. So, it would not be acceptable for an author to excuse inaccuracies in their published results as “AI wrote it.”

· Association for Computing Machinery: [https://www.acm.org/publications/policies/frequently-](https://www.acm.org/publications/policies/frequently-asked-questions) [asked-questions;](https://www.acm.org/publications/policies/frequently-asked-questions)

· Discussion on Journal of American Medical Association (JAMA) rules on the use of AI: [https://jamanetwork.com/journals/jama/fullarticle/2807956;](https://jamanetwork.com/journals/jama/fullarticle/2807956)

· Nature: <https://www.nature.com/articles/d41586-023-01546-4>

· Jennifer Harker, “Science journals set new authorship guidelines for AI-generated text”, Environmental Factor, National Institute of Environmental Health Sciences, March 2023, accessed October 16, 2023, [https://factor.niehs.nih.gov/2023/3/feature/2-artificial-intelligence-](https://factor.niehs.nih.gov/2023/3/feature/2-artificial-intelligence-ethics) [ethics.](https://factor.niehs.nih.gov/2023/3/feature/2-artificial-intelligence-ethics)

· This editorial includes the following suggestion for consideration for research publications: “Authors should specify who used the system, the time and date of the use, the prompt(s) used to generate the text, the sections(s) containing the text; and/or ideas in the paper resulting from NLP use.” From an editorial in the Journal on Accountability in Research.

· Guidelines on Authorship:

· “Defining the role of authors and contributors”, International Committee of Medical Journal Editors (ICMJE) (2023) https://[www.icmje.org/recommendations/browse/roles-](http://www.icmje.org/recommendations/browse/roles-) and-responsibilities/defining-the-role-of-authors-and-contributors.html

· Editorial Policies of Nature: <https://www.nature.com/nature-portfolio/editorial-policies/authorship#authorship> (2023). adapted from McNutt et al., Proceedings of the National Academy of Sciences, Feb 2018, 201715374; DOI: 10.1073/pnas.1715374115; licensed under CC BY 4.0):

· Editorial Policies of Science: [https://www.science.org/content/page/science-journals-](https://www.science.org/content/page/science-journals-editorial-policies#authorship) [editorial-policies#authorship](https://www.science.org/content/page/science-journals-editorial-policies#authorship)

Cited and Additional References and Resources

“New Policies Navigate Role of AI Assistants in CS Courses”, downloaded July 9, 2024, [https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-](https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses?utm_source=newsletter&utm_medium=email&utm_content=New%20Policies%20Navigate%20AI%20in%20Computer%20Science&utm_campaign=Daily%20Digest%20-%20June%2022%2C%202023) [courses?utm\_source=newsletter&utm\_medium=email&utm\_content=New%20Policies%20Navigate%20](https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses?utm_source=newsletter&utm_medium=email&utm_content=New%20Policies%20Navigate%20AI%20in%20Computer%20Science&utm_campaign=Daily%20Digest%20-%20June%2022%2C%202023) [AI%20in%20Computer%20Science&utm\_campaign=Daily%20Digest%20-%20June%2022%2C%202023](https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses?utm_source=newsletter&utm_medium=email&utm_content=New%20Policies%20Navigate%20AI%20in%20Computer%20Science&utm_campaign=Daily%20Digest%20-%20June%2022%2C%202023)

“Prompt Engineering,” OpenAI Platform, accessed July 9, 2024, https://platform.openai.com/docs/guides/prompt-engineering/six-strategies-for-getting-better-results

Rutgers University Libraries, “Artificial Intelligence (AI) An introduction to generative AI and its use in teaching, research, and publishing”<https://libguides.rutgers.edu/artificial-intelligence/ai-in-research>

Mohammad Hosseini, Lisa M. Rasmussen & David B. Resnik (2023) “Using AI to write scholarly publications”, Accountability in Research, DOI: [10.1080/08989621.2023.2168535](https://doi.org/10.1080/08989621.2023.2168535)

“How to use Chat GPT: Opportunities and Risks for Researchers,” <https://www.animateyour.science/post/how-to-use-chat-gpt-opportunities-and-risks-for-researchers>

Mohamed Yusuf, “How to Use Chat GPT for Scientific Research Paper writing?”, accessed July 12, 2023, <https://ai.plainenglish.io/how-to-use-chatgpt-for-scientific-research-paper-writing-a84c514494b6>

Maggie Hicks, “No ChatGPT can’t be your new research assistant.” The Chronicle of Higher Education, August 23, 2023. Accessed October 16, 2023. [https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-](https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-research-assistant?sra=true&cid=gen_sign_in) [research-assistant?sra=true&cid=gen\_sign\_in](https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-research-assistant?sra=true&cid=gen_sign_in)

“Artiﬁcial Intelligence and the Future of Teaching and Learning, Insights and Recommendations”, Department of Education, May 2023, <https://www2.ed.gov/documents/ai-report/ai-report.pdf>

**Sample 1**

**Eﬀective and Responsible Use of AI in Research:**

**Guidance for Performing Graduate Research and in Writing Dissertations, Theses, and Manuscripts for Publications[[4]](#footnote-4)**

**Introduction**:

Creating new knowledge and performing research is the purpose of graduate research.. Novice researchers must learn essential critical thinking skills needed to formulate a research idea, determine appropriate methods and approaches for the research plan, collect data, summarize results, and draw conclusions. AI can be a valuable tool to assist in this endeavor but it is not an accountable entity for the research outcomes - the ultimate responsibility of research lies with the researcher, not the machine.

That being said, Large Language Models (LLMs) and generative artificial intelligence (AI) platforms are generating significant shifts in how this research is conducted. This document is intended as a provocation to discuss this very fluid and rapidly changing landscape of AI[[5]](#footnote-5). It should be tailored to align with accepted practices within specific disciplines and adapt to the circumstances as they arise.

Best practice suggests that mentors and research supervisors will have regular and continuing conversations with mentees and other students/trainees about the intended use of generative AI in their research programs.

**AI and graduate research:**

The use of artiﬁcial intelligence has expanded greatly in recent years in all sectors of society. Generative AI and Large Language Models, like [ChatGPT](https://openai.com/index/chatgpt/)®, [Microsoft Co-Pilot](https://copilot.microsoft.com/)®, [Google Gemini](https://gemini.google.com/?utm_source=google&utm_medium=cpc&utm_campaign=2024enUS_gemfeb&gad_source=1&gclid=EAIaIQobChMI3KDYzcKchwMV2Ub_AR3MFwXKEAAYASAAEgI75vD_BwE&hl=en)®, [GitHub Copilot](https://github.com/features/copilot/)® and [Stable Diffusion](https://stablediffusionweb.com/)® are rapidly becoming available, expanding access to this technology for use by anyone who is digitally literate.

These tools can speed up and systematize some aspects of research, and this guidance document is developed to assist graduate students in this purpose. The guidelines presented here are recommendations for departmental and program consideration only, not UCOP/University of California, Riverside policy.

There are two ways of thinking about the use of AI

1. As a very flexible and nimble processor. AI can sort through large databases, extract data from large databases, fix scripts/code, manage and organize multiple schedules, randomize samples
2. As a means of generating research: asking AI to write a part of a document, to write new code, to summarize a body of literature, to provide citations, references or edit existing text

**AI +++**  PLUSES

* Super efficient processor: It can sort through a large amount of information quickly to synthesize content from that information.
* Excellent data miner: It is good at summarizing existing information that is freely available and not behind ﬁrewalls or paywalls and is neither too old nor too recent. For example, it can summarize existing methodologies in a particular research area or positions on a topic.
* Good editor: It may help improve the legibility of text written by non-native speakers.

**AI - - -** MINUSES

* Low originality score: Current algorithms are good at summarizing but not necessarily generating accurate and dependable NEW or creative ideas.
* Iffy reliability: ChatGPT® has the following disclaimer: *“While we have safeguards in place, the system may occasionally generate incorrect or misleading information and produce offensive or biased content. It is not intended to give advice.”* This is because the quality of the output depends both on the algorithmic approach and the quality of the training data. Content generated may sound plausible, but is often inaccurate or fabricated (“AI hallucinations”[[6]](#footnote-6))
* Bias: People are prone to biases in their work, and AI can pick up those biases from the training data and even amplify them[[7]](#footnote-7).
* IP/privacy: You need to assume that data you input to a Large Language Model will be owned by the company that is making the AI available to you. Assume that whatever is fed into a query will now be owned by that company.[[8]](#footnote-8)

Things to think about/discuss:

* Should students use AI as a tool to help generate research ideas and approaches?
* Should students use AI as a writing or editing tool for publications and their thesis?
* How can we assess the accuracy of the results from an AI source?
* How conﬁdential is the process? Is a student giving away valuable ideas or research results to an open platform (like ChatGPT) before the topic is peer reviewed and published? Will you lose your intellectual property rights, such as patents?
* Are students at risk of committing research misconduct in the form of plagiarism if they use a generative AI platform to write parts of their thesis?
* How can students (and other researchers) transparently indicate within their written works the contribution of generative AI or other assistive technologies?
* What restrictions do professional societies and publishers place on the use of AI in publications and in reviewing papers or proposals?

***Examples of uses of AI in Research Ideas or Approaches:***

* **Brainstorming**: You can use the AI tool as a brainstorming partner, where you exchange ideas whether the AI prompts you or you prompt the AI for ideas. Brainstorming is an iterative process that can be made more eﬀective with the way that the queries are posted. For more samples or information, post this query: “How can I use AI to help me to brainstorm an idea?”
  + Is it ok to use an AI source in brainstorming or otherwise to help generate research ideas? How does this compare to brainstorming ideas with human collaborators? Consider, for example, brainstorming done among human colleagues that results in research that is published. The contribution of the collaborators, if substantial, may result in an acknowledgement in the manuscript or authorship attribution. AI brainstorming can be treated similarly, **to an extent**. An AI session that resulted in novel ideas may be recognized in the published work, but an authorship attribution is not warranted; the sampling of guidelines of authorship, given in the section on Professional Societies and Publishers below, all require that an author approve the ﬁnal manuscript and be held accountable for the content. Neither of these requirements would be possible for an AI agent to fulfill in order to receive authorship recognition.
* **Surveying Existing Approaches**: Large Language Models, if trained broadly in a topic, can give a good initial overview of existing approaches or existing literature on a topic. Current research sources such as library or professional society databases are more reliable in terms of accuracy of peer-reviewed content. See the [Rutgers University Library site](https://libguides.rutgers.edu/artificial-intelligence/ai-in-research) for guidance and AI platforms for searching research databases.

**Advice on Usage:**

* **Prompt engineering is important**: The value of the response depends on the value of the prompt. If you provide a low quality or vague prompt, you will get vague results. Critical thinking skills are enhanced by learning how to iterate on the prompts to reﬁne results or to use the material gathered from one result to identify new avenues of inquiry to pursue. Varying skill levels among users might exacerbate existing inequalities among students. For example, students for whom English is the second language might be at a disadvantage. Examples of strategies for prompt engineering are found in the [OpenAI Guide](https://platform.openai.com/docs/guides/prompt-engineering/six-strategies-for-getting-better-results) and in [Ivan Allen article on prompt engineering.](https://iac.gatech.edu/featured-news/2024/02/AI-prompt-engineering-ChatGPT)
  + Be scientific with your prompts (or queries): Prompting is not deterministic, so the same prompt at a different time may result in a different response. Small changes in the wording of the prompt may yield very different responses. Keep records, make small changes and see how it affects the outcome, etc.
  + Don’t share any data or information that is confidential, proprietary, or have IP implications. Your uploaded data or ideas might be incorporated into the learning model to be available for others in your research area, prior to you having a chance to publish it. If you intend to pursue commercialization or other Intellectual Property avenues for your work, putting the information into an open AI platform may be considered as disclosure.
* **Be very skeptical of the results**: Do not trust any outputs that you cannot evaluate yourself or trace back to original credible sources. There are many stories of generative AI giving citations of articles that do not exist (see the article in the Chronicles of Higher Education referenced below[[9]](#footnote-9)).

—-------------------------------------------------

**Sample Guidance from Professional Societies, Publishers, and Funding Agencies:**

*Using AI in Reviewing Proposals and Papers:*

As a reviewer, you generally need to attest to conﬁdentiality of the information that you are to review, especially not sharing the information with others. Publishers and funding agencies are starting to put restrictions on the use of AI in the review process. For example,

“NIH prohibits NIH scientiﬁc peer reviewers from using natural language processors, large language models, or other generative Artiﬁcial Intelligence (AI) technologies for analyzing and formulating peer review critiques for grant applications and R&D contract proposals.” From [NIH](https://grants.nih.gov/grants/guide/notice-files/NOT-OD-23-149.html) [Notice Number NOT-OD-23-149](https://grants.nih.gov/grants/guide/notice-files/NOT-OD-23-149.html)

*Authorship and AI:*

Below are several links to authorship guidelines from societies and publishers. The additional guidelines on authorship listed below have a common element: an author is responsible for the content of their work. So, it would not be acceptable for an author to excuse inaccuracies in their published results as “AI wrote it.”

· Association for Computing Machinery: [https://www.acm.org/publications/policies/frequently-](https://www.acm.org/publications/policies/frequently-asked-questions) [asked-questions;](https://www.acm.org/publications/policies/frequently-asked-questions)

· Discussion on Journal of American Medical Association (JAMA) rules on the use of AI: [https://jamanetwork.com/journals/jama/fullarticle/2807956;](https://jamanetwork.com/journals/jama/fullarticle/2807956)

· Nature: <https://www.nature.com/articles/d41586-023-01546-4>

· Jennifer Harker, “Science journals set new authorship guidelines for AI-generated text”, Environmental Factor, National Institute of Environmental Health Sciences, March 2023, accessed October 16, 2023, [https://factor.niehs.nih.gov/2023/3/feature/2-artificial-intelligence-](https://factor.niehs.nih.gov/2023/3/feature/2-artificial-intelligence-ethics) [ethics.](https://factor.niehs.nih.gov/2023/3/feature/2-artificial-intelligence-ethics)

· This editorial includes the following suggestion for consideration for research publications: “Authors should specify who used the system, the time and date of the use, the prompt(s) used to generate the text, the sections(s) containing the text; and/or ideas in the paper resulting from NLP use.” From an editorial in the Journal on Accountability in Research.

· Guidelines on Authorship:

· “Defining the role of authors and contributors”, International Committee of Medical Journal Editors (ICMJE) (2023) https://[www.icmje.org/recommendations/browse/roles-](http://www.icmje.org/recommendations/browse/roles-) and-responsibilities/defining-the-role-of-authors-and-contributors.html

· Editorial Policies of Nature: <https://www.nature.com/nature-portfolio/editorial-policies/authorship#authorship> (2023). adapted from McNutt et al., Proceedings of the National Academy of Sciences, Feb 2018, 201715374; DOI: 10.1073/pnas.1715374115; licensed under CC BY 4.0):

· Editorial Policies of Science: [https://www.science.org/content/page/science-journals-](https://www.science.org/content/page/science-journals-editorial-policies#authorship) [editorial-policies#authorship](https://www.science.org/content/page/science-journals-editorial-policies#authorship)

**Cited and Additional References and Resources**

“New Policies Navigate Role of AI Assistants in CS Courses”, downloaded July 9, 2024, [https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-](https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses?utm_source=newsletter&utm_medium=email&utm_content=New%20Policies%20Navigate%20AI%20in%20Computer%20Science&utm_campaign=Daily%20Digest%20-%20June%2022%2C%202023) [courses?utm\_source=newsletter&utm\_medium=email&utm\_content=New%20Policies%20Navigate%20](https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses?utm_source=newsletter&utm_medium=email&utm_content=New%20Policies%20Navigate%20AI%20in%20Computer%20Science&utm_campaign=Daily%20Digest%20-%20June%2022%2C%202023) [AI%20in%20Computer%20Science&utm\_campaign=Daily%20Digest%20-%20June%2022%2C%202023](https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses?utm_source=newsletter&utm_medium=email&utm_content=New%20Policies%20Navigate%20AI%20in%20Computer%20Science&utm_campaign=Daily%20Digest%20-%20June%2022%2C%202023)

“Prompt Engineering,” OpenAI Platform, accessed July 9, 2024, https://platform.openai.com/docs/guides/prompt-engineering/six-strategies-for-getting-better-results

Rutgers University Libraries, “Artificial Intelligence (AI) An introduction to generative AI and its use in teaching, research, and publishing”<https://libguides.rutgers.edu/artificial-intelligence/ai-in-research>

Mohammad Hosseini, Lisa M. Rasmussen & David B. Resnik (2023) “Using AI to write scholarly publications”, Accountability in Research, DOI: [10.1080/08989621.2023.2168535](https://doi.org/10.1080/08989621.2023.2168535)

“How to use Chat GPT: Opportunities and Risks for Researchers,” <https://www.animateyour.science/post/how-to-use-chat-gpt-opportunities-and-risks-for-researchers>

Mohamed Yusuf, “How to Use Chat GPT for Scientific Research Paper writing?”, accessed July 12, 2023, <https://ai.plainenglish.io/how-to-use-chatgpt-for-scientific-research-paper-writing-a84c514494b6>

Maggie Hicks, “No ChatGPT can’t be your new research assistant.” The Chronicle of Higher Education, August 23, 2023. Accessed October 16, 2023. [https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-](https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-research-assistant?sra=true&cid=gen_sign_in) [research-assistant?sra=true&cid=gen\_sign\_in](https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-research-assistant?sra=true&cid=gen_sign_in)

“Artiﬁcial Intelligence and the Future of Teaching and Learning, Insights and Recommendations”, Department of Education, May 2023, <https://www2.ed.gov/documents/ai-report/ai-report.pdf>

Sample policies and guidance at other universities:

* Boston University - [https://www.bu.edu/cds-faculty/culture-community/conduct/gaia-policy;](https://www.bu.edu/cds-faculty/culture-community/conduct/gaia-policy)
* Stanford - [Generative AI Policy Guidance | Office of Community Standards (stanford.edu);](https://communitystandards.stanford.edu/generative-ai-policy-guidance)
* UCLA - [Guidance for the Use of Generative AI – UCLA Center for the Advancement of Teaching;](https://teaching.ucla.edu/resources/ai_guidance/)
* USC - [CIS-Generative-AI-Guidelines-20230214.pdf (usc.edu)](https://academicsenate.usc.edu/wp-content/uploads/sites/6/2023/02/CIS-Generative-AI-Guidelines-20230214.pdf)

1. We are grateful for permission to use and edit this document for our university community.

   This document derives from content developed at the Georgia Institute of Technology [Georgia Tech]. Content was gathered from experts at Georgia Tech in the areas of AI, in ethics, and in graduate education and edited by Bonnie Ferri. Speciﬁc groups of contributors at Georgia Tech include: Oﬃce of Graduate Education, Graduate Student Government Association, Oﬃce of Research, Responsible Conduct of Research Oﬃce, and Directors of Graduate Programs. Specific contributors to this UCR document include the Research Ethics Education Program, the Graduate Division, the Office of Research and Economic Development, and several faculty from across campus [↑](#footnote-ref-1)
2. ChatGPT® was asked similar questions, and both questions and the generated responses are given in the Appendix. **Note that ChatGPT® has the following disclaimer**: *“While we have safeguards in place, the system may occasionally generate incorrect or misleading information and produce offensive or biased content. It is not intended to give advice.”* [↑](#footnote-ref-2)
3. BUT see <https://www.nature.com/articles/d41586-024-03070-5?WT.ec_id=NATURE-202409&sap-outbound-id=ED8AFE4C7D0845502F5CCD47838E4B9C7382765C> for both contributions and limitations of AI to the generation of new ideas. [↑](#footnote-ref-3)
4. I am grateful to Dena Plemmons (UCR Grad Division Research Ethics Education Program) and the UCR ad-hoc committee on AI and Research [↑](#footnote-ref-4)
5. We are grateful for permission to use and edit this document for our university community.

   This document derives from content developed at the Georgia Institute of Technology [Georgia Tech]. Content was gathered from experts at Georgia Tech in the areas of AI, in ethics, and in graduate education and edited by Bonnie Ferri. Speciﬁc groups of contributors at Georgia Tech include: Oﬃce of Graduate Education, Graduate Student Government Association, Oﬃce of Research, Responsible Conduct of Research Oﬃce, and Directors of Graduate Programs. Specific contributors to this UCR document include the Research Ethics Education Program, the Graduate Division, the Office of Research and Economic Development, and several faculty from across campus who served on an ad hoc committee in the early stages of development. [↑](#footnote-ref-5)
6. <https://www.ibm.com/topics/ai-hallucinations>, [↑](#footnote-ref-6)
7. <https://mitsloanedtech.mit.edu/ai/basics/addressing-ai-hallucinations-and-bias/> [↑](#footnote-ref-7)
8. <https://hai.stanford.edu/news/privacy-ai-era-how-do-we-protect-our-personal-information> [↑](#footnote-ref-8)
9. Maggie Hicks, “No ChatGPT can’t be your new research assistant.” The Chronicle of Higher Education, August 23, 2023. Accessed October 16, 2023. [https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-](https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-research-assistant?sra=true&cid=gen_sign_in) [research-assistant?sra=true&cid=gen\_sign\_in](https://www.chronicle.com/article/no-chatgpt-cant-be-your-new-research-assistant?sra=true&cid=gen_sign_in) [↑](#footnote-ref-9)