# **AI Task Force**



# **Research Working Group**

# **Report & Recommendations**

Delivered June 2025



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# 1. Executive summary

Al has the potential to augment research to benefit humanity, leading to earlier discoveries and deeper understanding. We imagine a world where Al extends the scope of data and textual analysis; supports creative processes; offers simulations that predict experimental outcomes, test hypotheses, or help construct surveys; enables expanded access to information through translation, enhanced data management and improved metadata; extends researchers' abilities in coding, data analysis and data visualization; makes labs safer and supports research discovery and the development of research networks.

At the same time, Al use comes with costs and risks. These include environmental costs; risks to data sovereignty and security; potential harm from bias, inaccuracies or unattributed ideas in Al output; and unethical use of intellectual property in Al training. There may also be outcomes whose impacts are harder to predict, including the ways that Al might change the nature of academic research and scholarly inquiry; the impact of Al on trainees; and the broader impact of Al on society and work, including academic activities and the role of universities in society.

Acknowledging the opportunities and risks of Al use, the research working group recommends responsible and safe Al adoption, striking a balance between exuberance and reticence. Where Al offers opportunities to extend the quality and scope of their research output, researchers and U of T as an institution should be positioned to harness these potential opportunities. As U of T is a leader in Al research internationally, we have an opportunity and responsibility to embrace this technology and ensure that it is put to good use. The risks are real, but they can be thoughtfully managed. The University is a human institution, and we must integrate Al into our activities in ways that reflect institutional values and the well-being of our community members, including maintaining research integrity and ethics, ensuring data security and protecting intellectual property. Ultimately, we can be a model for how a university adapts to such technological shifts.

U of T is well-positioned to foster such an environment. As an international leader in AI, the University can lead in setting norms and principles around AI use in research to ensure that AI use reflects our commitments to research excellence, integrity and rigour, open scholarship, accountability and social impact. Additionally, we must recognize the limitations of the technology to support responsible and safe adoption. These norms and principles are informed by U of T's commitments to truth-seeking, academic excellence, ethical practices, and community engagement. While AI is a rapidly changing technology, and surely not the last disruptive technology that will impact the university, our core principles should remain steadfast, reflecting the essence of what it means to be a world-leading university and community of scholars.

Therefore, in our report, we make the following three overarching recommendations, supported by specific recommendations for researchers and for the institution. We recommend that:

- Researchers are encouraged to explore responsible AI use to advance the depth, quality and excellence of their research, while taking ownership of their actions with AI
- U of T support researchers in developing the skills to use AI in research effectively and responsibly, and provide the infrastructure and supports necessary to do so
- U of T leverage its leadership in AI to help establish and align norms and principles for AI use in research across the higher education landscape more broadly

#### **1.1 Summary of recommendations**

Our recommendations represent a synthesis of discussions within our Working Group, as well as external consultations. Our working group draws on faculty and staff across the University, many with deep expertise in AI, representing diverse academic disciplines and University functions. The recommendations and best practices presented in this report reflect our collective knowledge at this time.

#### **Recommendations for researchers**

Given emerging opportunities, risks and norms, we encourage U of T researchers—which includes faculty members, research staff, as well as students and trainees engaged in research—to explore the responsible use of AI to advance the depth and quality of their research in ways that align with longstanding University principles and values supporting research excellence. Specifically:

- We encourage all researchers to consider the potential of AI to augment their research, in line with their individual research practices and values, and with an understanding of emerging disciplinary norms
- We encourage those researchers who make use of AI to share their approaches and experiences with colleagues, to build institutional and disciplinary AI expertise and literacy
- In evaluating potential use of AI, it will be important for researchers to gain and/or maintain an understanding of current technologies, their strengths and limitations, and strategies for effective use and risk mitigation. Researchers must review any AI output; authors remain responsible for content bearing their name.
- To support transparency, we encourage researchers to disclose substantive AI use
- Authors should check the policies of relevant publishers and granting agencies for the most up-todate information regarding use of AI research and academic writing
- In line with emerging professional norms and expectations, AI should not be used to review papers
  or grant applications in a way that compromises peer-reviewer accountability or confidentiality
  requirements
- Faculty are encouraged to mentor and support their trainees in developing AI literacy as an academic and professional competency. Faculty who co-author a paper or produce other scholarly outputs with students under their supervision should check that those students are aware of their responsibilities in the use of AI, to reduce the risk of misuse or of contravening publisher or funder policies.

#### **Recommendations for the institution**

Our recommendations aim to support U of T in developing, showcasing and sustaining leadership in AI-enabled scholarly discovery. Given this, we recommend that U of T:

- Encourage AI use by researchers that results in scholarship and research excellence of the highest quality and ethical standard
- Continue to invest in being a world leader in AI research and AI-augmented research, including hiring the best candidates, building computational infrastructure, and promoting access to data
- Regularly review research policies and guidelines (including those related to research ethics) through an Al lens to ensure risks are managed and opportunities are captured
- Identify opportunities to use AI to streamline and support administrative tasks required by researchers or in research administration
- Develop training and professional development resources that will help its community use AI to its fullest potential
- Leverage its position as a world leader in AI to set norms and principles around AI use, lead policy development, and ensure alignment with positive societal impact

# 2. Working group membership and approach

## 2.1 Membership

#### Gary Bader (Co-Chair)

Professor, Molecular Genetics, Temerty Faculty of Medicine; Computer Science, Faculty of Arts & Science

#### Timothy Chan (Co-Chair)

Associate Vice-President & Vice-Provost, Strategic Initiatives; Professor, Mechanical & Industrial Engineering, Faculty of Applied Science & Engineering

#### Arij Al Chawaf

Executive Director, Strategic Initiatives, Division of the Vice-President, Research & Innovation

#### Ashton Anderson

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#### Andre Cire

Associate Professor, Management, University of Toronto Scarborough and Rotman School of Management

#### **Beth Coleman**

Associate Professor, Institute of Communication, Culture, Information & Technology, University of Toronto Mississauga

#### Avi Goldfarb

Professor, Marketing, Rotman School of Management

#### Rahul Krishnan

Assistant Professor, Computer Science, Faculty of Arts & Science and Laboratory Medicine & Pathobiology, Temerty Faculty of Medicine

#### Vinita Haroun

Director, Centre for Research & Innovation Support, Division of the Vice-President, Research & Innovation

#### Anastasia Kuzminykh

Assistant Professor, Faculty of Information

#### Scott Sanner

Professor, Mechanical & Industrial Engineering, Faculty of Applied Science & Engineering

#### Avery Slater

Associate Professor, English, University of Toronto Mississauga

#### Mindy Thuna

Associate Chief Librarian for Science Research & Information, University of Toronto Libraries

The membership of the Working Group includes researchers in the field of AI; scholars in other fields who use AI to conduct research; research administrators and educators; and faculty, staff and librarians from a range of areas offering important perspectives on the potential opportunities and challenges in research posed by AI. Several members of the Working Group serve as core faculty or in leadership roles in various institutes in the U of T AI ecosystem, including the Vector Institute, Schwartz Reisman Institute for Science & Technology, and the Data Sciences Institute.<sup>1</sup>

<sup>1</sup> Vector Institute for Artificial Intelligence. (n.d.). <u>https://vectorinstitute.ai/</u> Schwartz Reisman Institute for Technology and Society (SRI).(n.d.). <u>https://srinstitute.utoronto.ca/</u> Data Sciences Institute (DSI). (n.d.). <u>https://datasciences.utoronto.ca/</u>

### 2.2 Goals

The Research Working Group explored how AI does and might, in the future, affect research and the research life cycle at U of T. A particular focus was placed on generative AI (GenAI), motivated by its disruptive potential in how research is conducted and, ultimately, its potential ability to emulate human activity.

We identified two primary interested parties for our work: U of T researchers and their research teams (including graduate students and research staff), who use or are considering AI use in their research, and U of T as an institution, which needs to assess how AI use affects policies, processes, regulations, and resources within the university as they pertain to research.

## 2.3 Approach

We gathered information about relevant current use cases (and potential cases of misuse) at all stages of the research life cycle. To approach our work systematically and comprehensively, we explored use cases and impacts of Al using the research role categories defined in the Contributor Role Taxonomy (CRediT)<sup>2</sup> framework, supplemented with additional important categories of tasks (e.g., peer review, trainee mentorship). We used a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis for these research life cycle categories. We also reviewed activities, reports, recommendations and guidelines from other universities and research-related organizations (e.g., research funding agencies —see Appendix A for a list of relevant reports and research.)

#### We consulted with relevant groups within the U of T research community, including:

- Members of the Office of the Vice-President, Research & Innovation (VPRI) executive team
- Representatives from the Research Oversight & Compliance Office (ROCO)
- Members of the Research Advisory Board (RAB)
- Members of Research Administration Leaders Forum (RALF) committee
- Librarians and staff working with research data management and research tools and support within U of T Libraries
- Leadership from the School of Graduate Studies (SGS)
- Representatives from hospitals in the Toronto Academic Health Science Network (TAHSN)

Additionally, we drew on information from other consultations completed as part of the broader Al Task Force process, including the results from the U of T-wide Pulse survey of Al use in administrative work led by the People Strategy & Administration Working Group,<sup>3</sup> and consultations led by the Al Task Force with U of T leadership and community members.

<sup>2</sup> National Information Standards Organization. (n.d.). Contributor Role Taxonomy (CRediT). <u>https://credit.niso.org/</u>

<sup>3</sup> University of Toronto AI Task Force. (2024, December 17). AI Task Force survey. <u>https://utoronto.sharepoint.com/sites/</u> <u>dvpp-ai/SitePages/AI-Task-Force-survey--AI-use-in-administrative-work-by-U-of-T-staff,-faculty-and-librarians.aspx</u>

# 3. Al and the research process: uses and tools

To consider how AI might most effectively and responsibly be used in research, we begin with an overview of current AI capabilities and tools to illustrate the scope and impact of AI in the research process, recognizing that these capabilities will evolve quickly.

## 3.1 External reports and guidelines for AI use in research

#### **Opportunities for AI to augment research**

While many AI tools and capabilities are so new that researchers are still exploring potential use cases, researchers and organizations have developed reports or guidelines that describe the potential uses of AI throughout the research process. These are helpful as a reference for researchers, and in ensuring that our Working Group considered the full scope of potential use cases.

Al can, of course, support a range of tasks associated with writing and editing text, including drafting, summarizing, and revising. In a research context, this can support writing related to research as well as writing related to the administrative tasks associated with research (e.g., completing forms and applications).

A recent survey of current AI use by researchers in Nature highlights the prevalence of these writing and editing-related tasks. These tasks are also areas where researchers currently find AI to perform best relative to humans. This survey finds less use of and confidence in AI for tasks related to collecting and analyzing research information, or for other tasks related to experimentation.<sup>4</sup>

Similarly, a survey through Oxford University Press<sup>5</sup> highlights the caution with which researchers currently approach AI. It places researchers' attitudes towards the use of GenAI in research on a spectrum from "completely against AI" to "fully embracing AI," with about 10–20% in the most enthusiastic category (highest in science, technology, engineering, and mathematics (STEM) fields, and lowest in the humanities).

While extensive use of AI for specific research tasks may therefore not yet be prevalent, several reports and articles describe possibilities for AI to support such tasks.

A well-known writer on AI, Ethan Mollick, co-director of the Generative AI Labs at the Wharton School of Management at the University of Pennsylvania, has addressed potential uses of AI in research in his newsletter. In "Four Singularities for Research,"<sup>6</sup> Mollick describes:

- The capabilities of AI in text analysis across large context windows
- Its ability to simulate human subjects, and to generate hypotheses (e.g., by identifying unusual relationships in data)
- The potential of AI to identify relationships between research and researchers

<sup>4</sup> Naddaf, M. (2025). How are researchers using AI? Survey reveals pros and cons for science. Nature. <u>https://doi.org/10.1038/d41586-025-00343-5</u>

<sup>5</sup> Oxford University Press. (n.d.). Researchers and AI: Survey Findings. https://academic.oup.com/pages/ai-survey-findings

<sup>6</sup> Mollick, E. (2024, May 26). Four singularities for research. One Useful Thing. <u>https://www.oneusefulthing.org/p/four-singularities-for-research</u>

#### A report on GenAI in social science research<sup>7</sup> highlights the potential for AI to be used to:

- Provide examples or simulations to support experiments
- Generate and revise survey questions, including by testing simulated responses
- Offer human-like interactions in one-on-one chats or by simulating group behaviour
- Code datasets and conduct other textual analyses enablingr the use of much larger unstructured datasets in research

# An OECD report on Artificial Intelligence in Science<sup>8</sup> notes opportunities for AI to accelerate scientific research through:

- Al-driven verification of results
- · Robot labs and simulated experiments
- Enhanced research discovery and communication
- Identifying and testing potential compounds to support drug discovery or materials science

In addition to such opportunities, the UK Royal Society<sup>9</sup> discusses the potential for GenAl to generate and translate code used to conduct subsequent analyses.

At U of T, we have several examples of Al-supported research in action; beyond the many analyses of large datasets supported by ML models in a range of fields, the Acceleration Consortium has implemented "self-driving labs...to autonomously and rapidly design and test new materials"<sup>10</sup> and the Vector Institute supports researchers using Al in research across health, chemistry, and statistics, among many other fields, as described through their research reports.<sup>11</sup>

#### AI and research ethics and integrity

U of T describes research integrity as "the expectation that each member of the University of Toronto has a responsibility to foster intellectual honesty and to be vigilant regarding the conduct of research and scholarship, whether their own or others."<sup>12</sup>

Several external reports and publications offer emerging principles and norms to guide researchers in ethical AI use and AI use that fosters research integrity. In addition to broader considerations related to equity and the social and environmental impact of AI, organizations have identified key principles to inform the use of AI in research, as well as some of the risks particular to research ethics and integrity.

While these principles may highlight areas of caution or even suggest limits on AI use, articulating norms and standards can help encourage broader adoption of AI by helping researchers feel confident that they are operating within acceptable boundaries.

11 Vector Institute. (n.d.). Research. https://vectorinstitute.ai/research/

<sup>7</sup> Blau, W., Cerf, V. G., Enriquez, J., Francisco, J. S., Gasser, U., Gray, M. L., Greaves, M., Grosz, B. J., Jamieson, K. H., Haug, G. H., Hennessy, J. L., Horvitz, E., Kaiser, D. I., London, A. J., Lovell-Badge, R., McNutt, M. K., Minow, M., Mitchell, T. M., Ness, S., ... Witherell, M. (2024). Protecting scientific integrity in an age of generative AI. *Proceedings of the National Academy of Sciences*, 121(22). <u>https://doi.org/10.1073/pnas.2407886121</u>

<sup>8</sup> Organisation for Economic Co-operation and Development. (2023, June 25). Artificial Intelligence in Science. https://www.oecd.org/en/publications/artificial-intelligence-in-science\_a8d820bd-en.html

<sup>9</sup> Royal Society. (2024, May). Science in the age of AI. <u>https://royalsociety.org/news-resources/projects/science-in-the-age-of-ai/</u>

<sup>10</sup> Acceleration Consortium. (2024). *Impact*. <u>https://acceleration.utoronto.ca/impact</u>

<sup>12</sup> University of Toronto, Division of the Vice-President Research & Innovation. (n.d.). Research Integrity. https://research.utoronto.ca/research-integrity/research-integrity

#### **Key principles**

The UK Royal Society emphasizes that trust in AI among researchers and the public is a necessary precursor to extending its use in research.<sup>13</sup> Similarly, a Nature study of AI use by researchers<sup>14</sup> notes that concerns about ethics and research integrity, as well as a lack of clarity on norms or expectations for AI use, can be sources of hesitancy to use AI for research.

In an attempt to clarify norms for AI use, organizations have identified principles to help ensure that research supported by AI maintains internationally accepted standards for research integrity.

As defined by, among others, the US National Academy of Sciences, key principles include: verification of Al-generated content, attribution and documentation of Al-generated information, transparency and disclosure of Al use, practices that support reproducibility, and attention to biases and inequities.<sup>15</sup>

As we heard in consultation with faculty and staff in the Centre for Indigenous Studies, Indigenous data sovereignty<sup>16</sup> and governance<sup>17</sup> are important principles informing research involving Indigenous data or in using AI tools trained using data from or about Indigenous communities. AI's inherent tendency to consolidate, decontextualize and repurpose information used in model training may run counter to these principles; additionally, typical open data practices used in academic contexts (e.g. the FAIR principles) may offer limited provision for Indigenous data sovereignty.<sup>18</sup>

Together, such reports note the evolving nature of norms and principles, emphasizing the need to monitor and adapt expectations as the technology and its use evolves, and ultimately to develop "standardised methods for conducting ethics impact assessments."<sup>19</sup> Additionally, the Royal Society notes that these norms and expectations will vary by discipline and methodology, advocating that fields establish "domain-specific taxonomies of Al risks."<sup>20</sup> Similarly, Cornell recommends that its community "actively develop the norms and best practices around the use of GenAl in their disciplines."<sup>21</sup>

- 17 Global Indigenous Data Alliance. (2023, January 23). CARE Principles. <u>https://www.gida-global.org/care</u> The First Nations Information Governance Centre. (n.d.). *The First Nations Principles of OCAP®*. <u>https://fnigc.ca/ocap-training/</u>
- 18 CARE principles "complement the existing data-centric approach represented in the 'FAIR Guiding Principles for scientific data management and stewardship' (Findable, Accessible, Interoperable, Reusable)." Carroll, S. R., Garba, I., Figueroa-Rodríguez, O. L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R., Sara, R., Walker, J. D., Anderson, J., & Hudson, M. (2020). The CARE Principles for Indigenous Data Governance. *Data Science Journal, 19*(1). <u>https://doi.org/10.5334/dsj-2020-043</u>
- 19 Royal Society. (2024, May). Science in the age of AI. <u>https://royalsociety.org/news-resources/projects/science-in-the-age-of-ai/</u>, p. 14
- 20 Royal Society. (2024, May). Science in the age of Al. https://royalsociety.org/news-resources/projects/science-in-the-ageof-ai/,p. 15
- 21 Cornell University Research & Innovation. (2023, December 15) Generative AI in Academic Research: Perspectives and Cultural Norms. https://research-and-innovation.cornell.edu/generative-ai-in-academic-research/

<sup>13</sup> Royal Society. (2024, May). Science in the age of AI. <u>https://royalsociety.org/news-resources/projects/science-in-the-age-of-ai/</u>, p. 40.

<sup>14</sup> Naddaf, M. (2025). How are researchers using Al? Survey reveals pros and cons for science. *Nature*. https://doi.org/10.1038/d41586-025-00343-5

<sup>15</sup> Blau, W., Cerf, V. G., Enriquez, J., Francisco, J. S., Gasser, U., Gray, M. L., Greaves, M., Grosz, B. J., Jamieson, K. H., Haug, G. H., Hennessy, J. L., Horvitz, E., Kaiser, D. I., London, A. J., Lovell-Badge, R., McNutt, M. K., Minow, M., Mitchell, T. M., Ness, S., ... Witherell, M. (2024). Protecting scientific integrity in an age of generative Al. *Proceedings of the National Academy of Sciences*, 121(22). Additionally, the University of Virginia emphasizes transparency, verification, documentation of Al-generated data, and awareness of emerging norms: University of Virginia, Office of the Vice President for Research. (n.d.). *Reminder of the Importance of Research Integrity & Use of Al* <u>https://compliance.research.virginia.edu/</u> about/integrity-and-ethics/reminder-importance-research-integrity-use-ai.

<sup>16</sup> University of Toronto Libraries Research Guides. (2024, October 23). Indigenous Data Sovereignty. <u>https://guides.library.utoronto.ca/indigenousstudies/datasovereignty</u> University of British Columbia Faculty of Arts. (2024, June 18). Indigenous data stewardship stands against extractivist AI. <u>https://arts.ubc.ca/news/indigenous-data-stewardship-stands-against-extractivist-ai/</u>

An important component of graduate student training and development will be to help graduate students understand these emerging norms. The Council of Ontario Universities highlights the responsibility of supervisors to "discuss and share when generative AI will be or has been used" as essential to "building trust and establishing norms of use."<sup>22</sup>

#### **Risks to research ethics and integrity**

Use of AI in the research process can make the following types of research misconduct more feasible or likely. This misconduct might arise from a lack of AI literacy (that is, understanding how AI generates information, and the limitations of its output) or from deliberate misuse of AI in research. Chen et al.<sup>23</sup> group this misuse into three broad categories:

- **Data fabrication or falsification**: "the use of AI to generate false data or manipulate data to conform to desired outcomes"
- Plagiarism: generating text "without proper citation or acknowledgments of original sources"
- Opacity of results: use of AI without appropriate disclosure of "methodologies or data sources"

Additionally, AI misuse can stem from "misinterpretation of AI results" and "overreliance on AI."<sup>24</sup> This might include, for example, a failure to review AI output for accuracy, to appropriately contextualize AI-generated content,<sup>25</sup> or to ensure the rigour and appropriateness of analyses designed or recommended by AI such as, for example, the "inappropriate application of statistical models."<sup>26</sup>

Privacy violations are another important ethical risk.<sup>27</sup> Al analyses, for example, may allow for reidentification of anonymized research subjects, or confidential data might be stored or shared in a third-party Al tool. The Technology, Data Governance & Digital Trust Working Group has addressed privacy and data security with Al tools.

In addition to clarifying norms and expectations for AI use, support for AI literacy (discussed in Sections 5.3 and 6.5 below) can minimize the likelihood that researchers might unknowingly introduce these issues to their research.

However, a challenge to research integrity that may be more difficult to mitigate is reproducibility or explainability. Resnick and Hosseini<sup>28</sup> describe this as the "black box problem," referring to the inability to fully explain the process through which AI models produce their output. Without a full understanding of these processes, it is difficult to anticipate or mitigate potential errors, to interpret and verify results, or to extrapolate findings to other contexts. This both limits confidence in research findings and in AI output, and, given the probabilistic nature of these models, limits the ability to reproduce findings and experiments.<sup>29</sup>

<sup>22</sup> Ontario Council on Graduate Studies. (2024). Artificial Intelligence: Considerations for Graduate Research. https://cou.ca/wp-content/uploads/2024/10/OCGS-AI-graduate-research-considerations-FN-Oct-1-2024.pdf, p. 2.

<sup>23</sup> Chen, Z., Chen, C., Yang, G., He, X., Chi, X., Zeng, Z., & Chen, X. (2024). Research integrity in the era of artificial intelligence: Challenges and responses. *Medicine*, 103 (27). <u>https://doi.org/10.1097/MD.0000000003881</u>

<sup>24</sup> In addition to Chen et al. see also University of Virginia, Office of the Vice President for Research. (n.d.). *Reminder of the Importance of Research Integrity & Use of AI https://compliance.research.virginia.edu/about/integrity-and-ethics/reminder-importance-research-integrity-use-ai* 

<sup>25</sup> University of British Columbia Faculty of Arts. (2024, June 18). *Indigenous data stewardship stands against extractivist AI*. https://arts.ubc.ca/news/indigenous-data-stewardship-stands-against-extractivist-ai/

<sup>26</sup> Chen, Z., Chen, C., Yang, G., He, X., Chi, X., Zeng, Z., & Chen, X. (2024). Research integrity in the era of artificial intelligence: Challenges and responses. *Medicine*, 103(27). https://doi.org/10.1097/MD.00000000038811

<sup>27</sup> University of Virginia, Office of the Vice President for Research. (n.d.). Reminder of the Importance of Research Integrity & Use of AI. https://compliance.research.virginia.edu/about/integrity-and-ethics/reminder-importance-research-integrityuse-ai.

<sup>28</sup> Resnik, D. B., & Hosseini, M. (2024). The ethics of using artificial intelligence in scientific research: New guidance needed for a new tool. Al and Ethics, 1–23. <u>https://doi.org/10.1007/s43681-024-00493-8</u>

<sup>29</sup> Royal Society. (2024, May). Science in the age of AI. https://royalsociety.org/news-resources/projects/science-in-the-ageof-ai/, p. 40.

The Royal Society advocates for "the adoption of open science principles and practices" including "open data; open protocols; open code; and transparent peer review"<sup>30</sup> as one approach to mitigating these challenges, given that these practices can support trust and replicability.

# **3.2 Common use cases for GenAl in research**—opportunities and risks

While these tools can be applied to improve many areas of research, as the Working Group explored potential use cases with the recognition that AI tools come with risks that users must address in their use of AI. **For example**:

- Large Language Models (LLMs) can support the writing process, converting a bullet point outline to prose or offering suggestions to edit text. However, LLMs are prone to overly general writing or incorrect terminology, and this lack of precision could undermine public trust in the research.
- LLMs can translate or transcribe text, but might introduce hallucinated text or conceptual interpretations that don't reflect the source text
- Al can produce images or visualizations, but these images are prone to hallucinations and errors, much like Al-generated text, and Al output might closely imitate an actual artist's work, including work that has been used in model training without permission

To support researchers in exploring and planning for GenAl use in their research, Section 5.2 includes recommended practices associated with current common uses<sup>31</sup> of GenAl to illustrate the potential applications of these tools throughout the research process.

## **3.3 GenAl tools for research**

As surveys of AI use in research indicate, many researchers are aware of and may have experimented with conversational AI platforms and other standalone AI tools.<sup>32</sup> However, fewer researchers have explored more specialized AI tools, and may also not be familiar with the embedded AI capabilities now inherent in much existing software (e.g., AI was recently added to SCOPUS). Indeed, AI is pervasive, being used in smartphones, word processors and internet search engines, and it is likely that everyone in research is already using it, perhaps even without knowing it.

In Appendix B, we offer some examples of different types of AI tools and capabilities. We organize the tools as basic, intermediate or advanced to reflect the level of technical expertise or support required to implement the tool. These examples are intended to offer insight into the AI tools and capabilities currently available to researchers, and to encourage researchers to explore tools that might be of use to them in their research. However, please note that AI tools are emerging and evolving rapidly, and most of the tools referenced in Appendix B have not been vetted by the University for use with institutional or research data. Researchers should follow the guidelines from U of T's Information Security Office addressing how to "Use artificial intelligence intelligently" as well as the recommendations in this report when exploring potential tools.

<sup>30</sup> Royal Society. (2024, May). Science in the age of Al. <u>https://royalsociety.org/news-resources/projects/science-in-the-age-of-ai/</u>, p. 28.

<sup>31</sup> Some emerging but not yet common uses, such as simulated subjects and robotic labs, are discussed in the reports cited in Section 3.1.

<sup>32</sup> Naddaf, M. (2025). How are researchers using Al? Survey reveals pros and cons for science. Nature. <u>https://doi.org/10.1038/d41586-025-00343-5;</u> Oxford University Press. (n.d.). Researchers and Al: Survey Findings. <u>https://academic.oup.com/pages/ai-survey-findings</u>

## 4. External policies and guidelines for the use of AI in publications and grants

Researchers considering the use of AI in their work should be aware that publishers and funding agencies may set limits or define expectations for the use of AI in research work. We provide examples of these policies and expectations below. Given variation in these, researchers should confirm understanding of relevant policies before embarking on a project.

Given that these publishers and granting agencies have been early developers of concrete policies about appropriate or inappropriate use of AI and, therefore, are the source of emerging norms, we have also reviewed these statements to align and inform our recommendations, considerations and principles for researchers and the University.

## 4.1 Publisher policies

There are three key areas of focus for book or journal publishers when discussing the use of Al: authorship, images and primary data, and peer review and feedback.

#### Authorship

Using GenAl as a basic tool that supports authors in refining, correcting, formatting, and editing texts and documents is permissible, though information, data security and intellectual property must be protected. Authors should disclose any use of GenAl that transcends those use cases so an editorial decision can be made as to its legitimacy. Every major citation style has developed a format for citing Al generated material (text, images, etc.).<sup>33</sup>

Disclosure requirements vary across publishers. Authors should pay attention to where in the paper or book the disclosure of AI use must be included. The most common sections are the acknowledgements or methods. The content and level of required detail in the disclosure varies across publishers and can include the name of the AI tool(s) used, the date it was used, a description of how it was used, identification of the content generated and which aspects/sections were affected and/or generated by this usage, an evaluation of the validity of the tool's outputs, and the full prompt used.

Many journal policies stipulate that AI cannot be named as an author. This is also supported by several organizations, including the Committee on Publication Ethics (COPE).<sup>34</sup>

#### Images/original research data

Images (e.g., data visualisations) must accurately represent original research data. Thus, GenAl tools must not be applied to create, alter, or manipulate original research data and results, such as images, blots, photographs, x-rays, and measurements in a way that changes their interpretation. Al may be used to analyze images, such as to identify objects or reduce noise, but the original data must be made available in an unaltered form for others to analyze.

#### Peer review/feedback

All authors' work must be treated as confidential and proprietary and, therefore, no part of a work should be uploaded into a GenAl tool that does not guarantee confidentiality. This extends to any correspondence about the submitted work, so no communication materials should be uploaded into an Al tool, even to improve language and readability. Editors and reviewers are responsible and

<sup>33</sup> University of Toronto Libraries Research Guides. (2025, January 8) Citing sources / Create your bibliography: Citing artificial intelligence (AI).https://guides.library.utoronto.ca/c.php?g=251103&p=5296636

<sup>34</sup> COPE Council. (2023). Authorship and AI tools. https://doi.org/10.24318/cCVRZBms; STM Association. (2023). Generative AI in Scholarly Communications: Ethical and practical guidelines for the use of Generative AI in the publication process [White paper]. https://www.stm-publishing.com/stm-new-white-paper-launch-generative-ai-in-scholarly-communications; Elsevier. (2025). The use of AI and AI-assisted technologies in writing for Elsevier. https://www.elsevier.com/about/policiesand-standards/the-use-of-generative-ai-and-ai-assisted-technologies-in-writing-for-elsevier; and Cacciamani, G., Eppler, M., Ganjavi, C., Pekcan, A., Biedermann, B., Collins, G., & Gill, I. (2025, February 9). Development of the CHATGPT and Generative Artificial Intelligence Natural Large Language Models for Accountable Reporting and Use (CANGARU) guidelines. Open Science Framework. https://doi.org/10.17605/OSF.IO/9Y5NW

accountable for their feedback, communication and final decisions. This process requires critical thinking and original assessment, attributes and skills that are currently out of the scope of Al-assisted technologies.

To avoid inaccurate, incomplete, or biased conclusions, no AI tool should be used in the decisionmaking process or in the communication of the feedback or decision. As the technical capabilities of AI tools advance, there is likely to be modifications to their role in the peer review and editorial process. All this being said, some journals do allow some GenAI tools use when reviewing and/or editing materials,<sup>35</sup> so it is recommended to confirm what the policies are for a specific journal.

## 4.2 Funder policies

Some funding organizations have introduced guidance for researchers and reviewers, and in some cases for the research institution. While allowing for responsible AI use, these policies aim to maintain research integrity and ethical standards, and to align with emerging norms and regulations.

#### **Canadian policy**

Given our context, we look first to the Government of Canada and its funding agencies.<sup>36</sup> In November 2024, the agencies released new policy guidance that addresses the use of GenAl in the preparation and evaluation of grant applications.<sup>37</sup> Policy guidance is directed primarily to applicants and reviewers and draws on two existing policies: Tri-Agency Framework: Responsible Conduct of Research<sup>38</sup>; and Conflict of Interest and Confidentiality Policy of the Federal Research Funding Organizations.<sup>39</sup> This guidance highlights existing policy requirements:

- Named applicants are ultimately accountable for the contents of their application
- Privacy, confidentiality, data security and the protection of intellectual property must be prioritized in the development and review of grant applications

#### The new policy guidance can be summarized to two key points:

- Applicants must state if and how generative AI has been used in the development of their application
- Use of publicly available generative AI tools for evaluating grant applications is strictly prohibited

While the tri-agency statement only prohibits "publicly available generative AI tools", the NIH in the United States prohibits the use of local large language models (LLMs) as well.<sup>40</sup>

Excerpts from the policies, as well as policies from other jurisdictions, can be found in Appendix C.

- 38 Government of Canada Science and Innovation. (2024, April 29). Responsible Conduct of Research. https://science.gc.ca/ site/science/en/interagency-research-funding/policies-and-guidelines/responsible-conduct-research
- 39 Government of Canada. (2016, December 20). Conflict of Interest and Confidentiality. <u>https://science.gc.ca/site/science/en/interagency-research-funding/policies-and-guidelines/conflict-interest-and-confidentiality</u>
- 40 National Institutes of Health (2023, June 23). NOT-OD-23-149: *The Use of Generative Artificial Intelligence Technologies* is Prohibited for the NIH Peer Review Process. <u>https://grants.nih.gov/grants/guide/notice-files/NOT-OD-23-149.html</u>

<sup>35</sup> Leung, T. I., De Azevedo Cardoso, T., Mavragani, A., & Eysenbach, G. (2023). Best Practices for Using AI Tools as an author, peer reviewer, or editor. *Journal of Medical Internet Research*, 25. <u>https://doi.org/10.2196/51584</u>

<sup>36</sup> The Canadian Institutes of Health Research (CIHR); the Natural Sciences and Engineering Research Council of Canada (NSERC); the Social Sciences and Humanities Research Council of Canada (SSHRC); or the Canada Foundation for Innovation (CFI)

<sup>37</sup> Government of Canada. (2024, November 18). Guidance on the use of Artificial Intelligence in the development and review of research grant proposals. <u>https://science.gc.ca/site/science/en/interagency-research-funding/policies-and-guidelines/ use-generative-artificial-intelligence-development-and-review-research-proposals/guidance-use-artificial-intelligencedevelopment-and-review-research-grant-proposals</u>

## 5. Recommendations for researchers: conducting and assessing research

Given these emerging opportunities, risks and norms, our recommendations to U of T researchers which includes faculty members, research staff, as well as students and trainees engaged in research aim to encourage them to explore opportunities for AI to advance the depth and quality of their research in ways that align with longstanding University principles and values supporting research excellence.<sup>41</sup>

#### **Recommendations for researchers**

- We encourage all researchers to consider the potential of AI to augment their research, in line
  with their individual research practices and values, and with an understanding of emerging
  disciplinary norms
- We encourage those researchers who make use of AI to share their approaches and experiences with colleagues, to build institutional and disciplinary AI expertise and literacy
- In evaluating potential use of AI, it will be important for researchers to gain and/or maintain an understanding of current technologies, their strengths and limitations, and strategies for effective use and risk mitigation. Researchers must review any AI output; authors remain responsible for content bearing their name.
- To support transparency, we encourage researchers to disclose substantive AI use
- Authors should check the policies of relevant publishers and granting agencies for the most up-to-date information regarding use of Al in research and academic writing
- In line with emerging professional norms and expectations, AI should not be used to review
  papers or grant applications in a way that conflicts with peer-reviewer accountability or
  confidentiality requirements
- Faculty are encouraged to mentor and support their trainee in developing AI literacy as an academic and professional competency. Faculty who co-author a paper or produce other scholarly outputs with students under their supervision should check that those students are aware of their responsibilities in the use of AI, to reduce the risk of misuse or of contravening publisher or funder policies.

This section reviews fundamental principles for the use of AI in research and current recommended practices for GenAI use in research, and discusses how researchers might learn more about relevant AI tools and technologies.

## 5.1 Principles and responsibilities

U of T's Statement of Institutional Purpose<sup>42</sup> emphasizes our institution's commitment to high-quality research, academic freedom, intellectual integrity, promotion of equity, justice and diversity within the University, and the broader public educational mission of the university. Reflecting on these values alongside our goals for AI use by U of T researchers, we offer six principles to inform researchers' use of AI at our institution:

- Research excellence: Researchers should use AI where it can uphold and enhance research excellence
- Integrity and rigour: Researchers must ensure that they incorporate AI in their work in ways that adhere to the highest standards of research integrity. This includes transparent methodologies, accurate reporting of data and results, and the avoidance of plagiarism or misrepresentation.

<sup>41</sup> An in-depth discussion of approaches to ensuring alignment between AI use and research excellence: University of Toronto Centre for Research & Innovation Support (CRIS). (2025). *Generative AI Considerations in Academic Research*. https://cris.utoronto.ca/guides/genai\_considerations/

<sup>42</sup> University of Toronto Governing Council. (1992, October 15). *Statement of Institutional Purpose*. https://governingcouncil.utoronto.ca/secretariat/policies/institutional-purpose-statement-october-15-1992

- **Reproducibility and open scholarship**: Researchers should share data, methodologies, and findings as appropriate in a way that maximizes transparency and reproducibility, recognizing the additional challenges AI can pose to these approaches, and recognizing the need to align with principles of Indigenous data governance
- **Recognition of limitations**: Researchers must adopt AI responsibly, drawing on an understanding and consideration of AI limitations
- Accountability and societal impact: Researchers have a responsibility to evaluate and communicate the broader societal implications of incorporating Al into research processes
- **Supporting emerging scholars**: Researchers should guide and mentor emerging scholars in making decisions about Al use in research

# **5.2 Recommended practices and key cautions for GenAl** use in research projects

In this section, we translate these principles into recommended practices, along with considerations and cautions, for some of the current uses<sup>43</sup> of generative AI. Our goal is to help U of T researchers implement GenAI in ways that align with research excellence, integrity and ethics.

We draw on categories of research activities defined in the CRediT (Contributor Roles Taxonomy) framework<sup>44</sup> used to "represent the range of contributions that researchers make to published output." We have simplified the CRediT categories to organize our recommendations.

Recognizing that a range of AI tools and techniques, especially machine learning, have been incorporated into the research process for some time, we focus on considerations related to the use of newer GenAI tools. We also present recommended uses alongside cautions and additional considerations.

We also note that many researchers have broader concerns about the environmental and social impact of AI, as well as the broader potential impact of AI on academic and administrative activities within the University.

Researchers should be aware of the potential for LLMs to produce factual errors or "hallucinations" and must verify all AI output to ensure it is accurate and appropriate for their research context. Generally speaking, this means that researchers must be able to assess AI output at the level of an expert in the field; this is an important consideration when using AI to engage with resources or implement methodologies outside the researcher's primary fields of expertise or experience (e.g., if a researcher who is not a proficient programmer uses GenAI to generate code).

<sup>43</sup> Some emerging but not yet common uses, such as simulated subjects and robotic labs, are discussed in the reports cited in Section 3.1.

<sup>44</sup> National Information Standards Organization. (n.d.). Contributor Role Taxonomy (CRediT). https://credit.niso.org/

Table 1: GenAl uses,	considerations	and cautions
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	Typically appropriate uses	Considerations and cautions		
Writing (grants or publications)	<ul> <li>Offer suggestions to edit text for clarity or audience</li> <li>Provide simulated feedback from stakeholders with varying</li> </ul>	<ul> <li>Not often successful at declaring sources and citations (though this capability is improving)</li> <li>Avoid use of Al for initial generation</li> </ul>		
	perspectives	<ul> <li>of ideas as this may limit creativity</li> <li>Many LLMs are prone to overly general writing or subtly incorrect terminology that could harm writing quality</li> </ul>		
		<ul> <li>Disclosure of Al use may be required by funders or publishers</li> </ul>		
		• Uploading others' IP to an AI tool (e.g., to assess a proposal) is generally prohibited as a violation of confidentiality		
Research conceptualization; literature discovery and synthesis	<ul> <li>Organize and answer questions about a research topic</li> <li>Identify appropriate terminology of related work terms</li> <li>Aid the creativity and brainstorming process</li> <li>Summarizing or suggesting existing methodological practices for a given project</li> <li>Al may provide a quick summary of papers to support identification of relevant resources in research studies</li> </ul>	<ul> <li>Suggested sources might not exist</li> <li>Expert disciplinary judgement is required to assess the relevancy of suggestions or resources</li> <li>May offer limited assessment of the relative originality or contextual specificity of their source material</li> <li>May omit important details and ideas that are in the source material</li> <li>Texts may incorporate identifiable ideas, statistics, and traits from the original source material of other researchers without proper attribution</li> <li>Training sets may contain private information, non-consensually released material, unlawfully or unethically acquired cultural artifacts, and context-sensitive items from sacred religious practice and leading and advance</li> </ul>		
Data management, validation and curation	<ul> <li>Validate data through queries or automated checks</li> <li>Automate data management (e.g., by generating metadata)</li> <li>Identify and extract information from text or images</li> <li>Translate text between languages</li> <li>Transcribe interviews</li> <li>Assistive technological applications</li> </ul>	<ul> <li>Intellectual property or data security violations may arise if proprietary or confidential data is uploaded to LLMs</li> <li>Al might introduce additional or hallucinated text, context or conceptual interpretation<sup>45</sup></li> </ul>		

45 See, for example Science. (2024, April 26). *Al transcription tools 'hallucinate,' too*. https://www.science.org/content/article/ai-transcription-tools-hallucinate-too

	Typically appropriate uses	Considerations and cautions
Analysis and investigation	<ul> <li>Generate code (or improvements to code) for software or to run analyses</li> <li>Suggest ideas to the researcher regarding how to conduct an analysis</li> <li>Use natural language prompts to analyse data</li> <li>Analyse large text corpuses</li> <li>Automate analysis workflows</li> </ul>	<ul> <li>Note considerations above regarding the verification and assessment of Al output, especially where suggestions for analysis fall outside a researcher's normal approaches</li> <li>Explainability and reproducibility challenges may produce differing results each run</li> </ul>
Data visualization and image generation	<ul> <li>Automate steps or components of visualizations of existing data</li> <li>Produce fully synthetic images as decorative elements (e.g., for cover art, clip art, minor illustrations)</li> </ul>	<ul> <li>Al-generated images are prone to hallucinations and errors much like Al-generated text</li> <li>Some journal publishers have prohibited the use of generative AI in figure or image creation, except for artistic contexts</li> <li>Al generated images should include an appropriate reference (e.g., to the tool used)</li> <li>Avoid prompting AI for art "in the style of" which may imitate too closely an actual artist's work (including art that has been used for training without permission)</li> <li>Consider carefully when decorative elements should be generated by human artists who are compensated for their work</li> <li>When representing the U of T community (e.g., groups of students, or members of a research lab) use photographs from U of T's media bank whenever possible, rather than generating new synthetic images</li> </ul>
Supervision of research assistants and graduate students (see also SGS Guidance on the Appropriate Use of Generative Artificial Intelligence in Graduate Theses <sup>46</sup> )	<ul> <li>Researchers can use AI to identify resources or training plans for graduate student development</li> <li>Teach and model appropriate use of AI for graduate students</li> <li>Additional practices reflecting SGS guidance</li> </ul>	<ul> <li>The development of trainee research skills are expected to be fully managed and monitored by experienced human staff</li> <li>Faculty who co-author a paper or produce other scholarly outputs with a student as the "most responsible author" should check that students are aware of their responsibilities in the use of Al to reduce risk of misuse of Al or contravening publisher or funder policies in a publication</li> </ul>

<sup>46</sup> University of Toronto School of Graduate Studies. (2024, December 2). *Guidance on the Appropriate Use of Generative Artificial Intelligence in Graduate Theses*. <u>https://www.sgs.utoronto.ca/about/guidance-on-the-use-of-generative-artificial-intelligence/</u>

	Typically appropriate uses	Considerations and cautions
Research administration	<ul> <li>Researchers may consider using AI to support the crafting of research ethics board applications, reference letters, data management plans, etc.</li> </ul>	<ul> <li>Consider impact of Al-generated text on the impact and authenticity of reference letters</li> <li>Al-generated suggestions for research ethics or data management will be drawn from existing or historical protocols, so ensure that approaches reflect the specifics of a given project</li> </ul>
Peer review—an important misuse case	• N/A	<ul> <li>Likely to breach confidentiality requirements of original work if data is used for model training or shared with a third party</li> </ul>
		• May violate the intent of asking a specific reviewer to review a manuscript, proposal or other research, as Al cannot reproduce that reviewer's unique perspective and the experience they bring to the work
		• Lacks human judgement to ensure that peer review principles of fairness and absence of conflict of interest are maintained

## **5.3 Foundational AI literacy**

It is important for all researchers to ensure that they have foundational Al literacy, which includes an understanding of Al principles, applications, and ethical considerations, the ability to use basic Al tools effectively, and the capacity to evaluate their outputs critically, understand their underlying mechanisms, and contemplate their ethical and societal implications.<sup>47</sup>

This foundational understanding is especially important given that, increasingly, AI is embedded into standard software systems and tools, such as Microsoft Office, smartphones and search engines, and researchers might encounter or use AI capabilities without making a deliberate decision to do so. For all researchers, therefore, foundational AI literacy is important to ensuring that researchers are aware of the capabilities of AI, and can avoid misuse.

<sup>47</sup> For a description of common components of an AI literacy framework, see Lo, L. (2024). Evaluating AI Literacy in Academic Libraries: A Survey Study with a Focus on U.S. Employees. University of New Mexico University Libraries & Learning Sciences Faculty and Staff Publications. <u>https://digitalrepository.unm.edu/ulls\_fsp/203</u>

#### Such foundational AI literacy includes:

- Foundational AI concepts: Understand the basic mechanics of key AI concepts such as machine learning, natural language processing, neural networks, training data, and how AI systems are tested. Data literacy,<sup>48</sup> or knowing how to work with and use data effectively, is an important complement.
- **Matching tools to use cases**: Recognize current AI capabilities, and understand what kinds of AI tools are appropriate for which applications in the research setting
- Critically assessing Al output for quality, biases, and ethics: Understand Al's strengths and limitations; evaluate Al output for accuracy, fairness, and bias; and weigh Al use in a given context against a range of ethical considerations
- Understanding responsible AI use: In the research context this includes being aware of requirements for data protection, information security, and intellectual property, as well as applicable policies from publishers, funders, institutions and governments, and legal and regulatory requirements

Individuals can develop these skills in many ways, including via courses, certificates, boot camps, seminars, workshops, and self-guided learning. Additionally, faculty working with graduate students or who are supervising other researchers play an important role in ensuring their supervisees develop similar AI literacy.

Al is evolving quickly, thus researchers will need to continue to update their understanding of Al tools, capabilities, uses, limitations, and norms. Resources provided by the University and domain-specific resources offered by relevant professional organizations and societies will allow researchers to stay current on Al developments.

<sup>48</sup> For a description of data literacy, see Gartner. (2025) Data Literacy: A Guide to Building a Data-Literate Organization. https://www.gartner.com/en/data-analytics/topics/data-literacy and University of Toronto Scarborough. (2025). UTSC Library Foundational Data Literacy Skills Course. <u>https://www.utsc.utoronto.ca/thebridge/utsc-library-foundational-dataliteracy-skills-course</u>

## 6. Recommendations for the institution: support for Al-enabled research

U of T is well-positioned to lead in Al-enabled scientific discovery, shaping global norms and policies while promoting responsible acceleration of Al research.

In the short term, U of T can take steps to become an "Al-ready" institution, ensuring researchers can implement Al where relevant, allowing the University to most effectively advance human knowledge for the benefit of Canadians and others in the world.

There is also an opportunity for U of T to draw on its existing expertise in AI and its position as a global leader in research to take a central role in shaping emerging norms and policies globally to align AI's potential with ethical and regulatory standards that support responsible and safe use.

In the long term, U of T can become an "AI-excellent" organization, on the cutting edge of doing research in AI, educating the next generation of AI-supported researchers, using AI to enhance its research operations, and, ultimately, making positive societal impact with AI.

To support these goals, we offer core principles to inform institutional directions for AI-enabled research, discuss how policies and processes can remain up to date with respect to AI impacts, highlight opportunities to leverage AI for research administration, suggest resources that would support researchers in adopting AI, and conclude with thoughts on how to keep the community informed of new directions and developments.

#### **Recommendations for the institution:**

- Encourage AI use by researchers that results in scholarship and research excellence of the highest quality and ethical standard
- Continue to invest in being a world leader in AI research and AI-augmented research, including hiring the best candidates, building computational infrastructure, and promoting access to data
- Regularly review research policies and guidelines (including those related to research ethics) through an AI lens to ensure risks are managed and opportunities are captured
- Identify opportunities to use AI to streamline and support administrative tasks required by researchers or in research administration
- Develop training and professional development resources that will help our community use AI to its fullest potential
- Leverage U of T's position as a world leader in AI to set norms and principles around AI use, lead policy development, and ensure alignment with positive societal impact.

## 6.1 Principles and responsibilities

To effectively support AI-enabled research, U of T must continue to adhere to its core principles while adapting to the evolving landscape of AI. Below, we highlight principles that can shape U of T's decisions about AI use in research.

#### 1. Upholding core academic principles

Responsible use of AI must align with the University's mission to advance scholarly work that is of the highest quality and strengthen societal trust in research. Academic freedom is paramount, so the University maintains a research environment that nurtures exploration and creativity, while aligning technological progress with human values.

#### 2. Promoting ethical AI practices

Transparency in AI use fosters trust and accountability, ensuring that research findings are robust and verifiable. Data governance and data security practices preserve participant trust and enables research that adheres to the highest ethical standards.

#### 3. Ensuring policy and governance alignment

By proactively building adaptable Al governance and risk management frameworks, the University upholds its responsibility to protect participants, maintains ethical standards, and delivers reliable results, underscoring its commitment to truth and integrity. These frameworks should be aligned with, or could inform the development of, similar frameworks at other institutions or research organizations.

#### 4. Demonstrating leadership in AI-research and AI-accelerated research

To be a leader in discussions about the influence of AI on the research process, the University must also be a leader in research about and using AI. Collaboration and data sharing within U of T, its partner institutions, and beyond is critical to ensuring that it remains a leader in the global conversation about AI's role in research.

#### 5. Bringing together data, compute and expertise

To remain a leader in AI, U of T must invest in data, compute and talent to enable the creation, finetuning and deployment of next generation AI models, led by experts able to navigate complex ethical, technical, and methodological questions.

## 6.2 Reviewing U of T research policies and processes

To ensure its policies support the use of AI in research and enable a cohesive and future-proof approach to AI governance, the University should regularly review its research policies, as they may be affected by widespread AI use.

This review should involve researchers and other relevant stakeholders from areas including research misconduct, research ethics, research grant administration, and intellectual property. We anticipate that AI will not require the development of new institutional research policies, but rather that statements interpreting policy or offering implementation guidelines can support policy users in responding to the impact of AI.

Several options exist for ongoing review: 1) train those responsible for the policies to understand and include AI impacts in their evaluations, or 2) establish a dedicated group to monitor AI impacts across the University.

## 6.3 Leading AI implementation and alignment

U of T's contributions as a leader in Al can include input into the development of norms and guidelines for Al use in academic and private and public sector research. This might mean, for example, creating and sharing policy papers for the research community, developing and sharing model guidelines, convening experts for discussions of policies and best practices, and supporting research and pilot projects related to the use of Al in research. To this end, the institution can support the work of researchers and research centres that include a focus on Al safety and Al policy (such as the Schwartz Reisman Institute for Technology & Society and the Vector Institute), and can seek opportunities to help align practices within the research community through national and international networks.

We also need to communicate and coordinate with close partners. In particular, U of T can seek to harmonize AI activities with key research partners in our broader research ecosystem, such as TAHSN, to help maximize the impact of our AI-related endeavours while minimizing redundancy for our faculty and students. For example, having a harmonized approach to reviewing ethics applications for AI-related research across U of T and the TAHSN hospitals can speed up and ensure consistency in the research process.

## 6.4 Opportunities in research administration

To support research and research capacity, the University can explore the implementation of AI tools that streamline research administration. Below are some potential approaches and ideas, though in many cases, implementation would require additional investments in data and other infrastructure. This list is not exhaustive and should be reviewed further with relevant stakeholders to identify feasibility and risks (including from algorithmic bias or to the integrity of the research process).

1. Automating administrative tasks for grant development and grant management

- Grant proposal preparation: Al tools can assist in drafting grant proposals, suggesting edits, and aligning proposals and budgets with funding agency requirements. Al tools can also assist in drafting proposals and summaries for different purposes/audiences using the same original content. Tools are also available to check references to ensure the proposal is up-to-date with the most recent research.
- **Compliance monitoring**: Al can support the review of research proposals and budgets/budget justifications for eligibility and compliance with institutional and funding agency policies
- **Document management**: Al systems can classify, store, and retrieve documents, streamlining processes like grant tracking
- Improving communication and support: AI chatbots can answer common questions from faculty and staff about funding opportunities, deadlines, and procedures, and recommend topic-specific funding opportunities
- Personalized notifications: Al can send tailored reminders for grant submission deadlines or reporting requirements

#### 2. Facilitating collaboration and expertise discovery

- **Collaborator matching**: Al can recommend collaborators within and outside the University and discipline based on research interests and expertise to address funding and project opportunities, including from industry or international partners
- Identifying experts: AI can help identify subject matter experts to serve on committees for peer review and adjudication, and may be able to automatically identify conflict of interest relationships

#### 3. Improving research security

- Security compliance: Al can review grants and assess security compliance according to government and funder regulations<sup>49</sup>
- Information technology security: AI can help secure research facilities by automatically monitoring internet activity or other sources of information for threats

#### 4. Enhancing data management and analysis

- **Research metrics and reporting**: Al can automate the generation of reports on research productivity, citation impact, and funding allocation. Al systems can integrate data from these and other sources (e.g., publication databases, grant systems) to provide comprehensive dashboards for administrators and researchers.
- **Data management plans**: Al can help draft data management plans that are often required for funding applications

<sup>49</sup> Government of Canada. (2024). Sensitive Technology Research Areas. <u>https://science.gc.ca/site/science/en/safeguarding-your-research/guidelines-and-tools-implement-research-security/sensitive-technology-research-and-affiliations-concern/sensitive-technology-research-areas</u>

#### 5. Drafting administrative letters

**Letter writing**: Al can draft custom letters (e.g., award nominations, grant support letters, student reference letters) using starting material such as a CV or list of impactful publications and activities.

#### 6. Streamlining tasks for ethical and regulatory oversight

- Assistance with protocol review: AI can assist research ethics boards (REBs) in reviewing research
  protocols for adherence to guidelines
- Risk assessment tools: Al can flag potential risks or ethical concerns in research proposals
- Identify undisclosed use of AI: Tools like Springer Nature's Geppetto<sup>50</sup> may help identify inappropriate or undisclosed use of AI

#### 7. Streamlining funding identification

- Funding matchmaking tools: Al can match a researcher with relevant funding opportunities based on their profile
- Predictive analytics for success rates: Al can analyze historical data to estimate the likelihood
  of funding success for different grant opportunities or proposals

### 6.5 Developing resources to support AI use in research

Al literacy and support are essential to the safe and effective use of Al. To support effective use of Al by researchers, U of T can offer training and resources.

#### This can include:

- Resources to help all members of U of T's research community develop the foundational AI literacy skills described in Section 5.3, including best practices, FAQs and guidelines to help researchers use and evaluate AI tools
- Training modules and resources to build basic AI skills, including the use of LLMs for research writing, literature reviews, data analysis, and general productivity improvement, targeted to different audiences and needs
- Programs to enable all those involved in research, including faculty, staff, librarians and students, to keep current with AI developments

We recommend building off and enhancing existing resources, leveraging the pedagogical strengths of our course material and experienced faculty at the University, including academic courses and programs, library resources, <sup>51</sup> the Centre for Research and Innovation Support, <sup>52</sup> SciNet, <sup>53</sup> and certificate programs, such as from U of T's Data Sciences Institute. <sup>54</sup>

<sup>50</sup> Springer Nature. (2024, June 12). Springer Nature unveils two new AI tools to protect research integrity. <u>https://group.</u> springernature.com/gp/group/media/press-releases/new-research-integrity-tools-using-ai/27200740

<sup>51</sup> University of Toronto Libraries. (n.d.). Does library support using generative artificial intelligence (GenAI) in my research or studies? https://onesearch.library.utoronto.ca/faq/does-library-support-using-generative-artificial-intelligence-genai-myresearch-or-studies

<sup>52</sup> University of Toronto Centre for Research & Innovation Support (CRIS). (2025). Generative AI Considerations in Academic Research. <u>https://cris.utoronto.ca/guides/genai\_considerations/</u>

<sup>53</sup> University of Toronto SciNet. (n.d.). Training & Education. https://scinethpc.ca/training-outreach-and-education/

<sup>54</sup> University of Toronto Data Sciences Institute (DSI). (n.d.). Data Science Certificate and Machine Learning Software Foundations Certificate. https://certificates.datasciences.utoronto.ca

# Develop AI expertise among researchers and staff. Beyond these foundational skills, U of T can build AI expertise by:

- Supporting and encouraging researchers and trainees to participate in advanced AI mentoring programs, such as CIFAR NextGen AI Training Programs<sup>55</sup> and the Eric and Wendy Schmidt AI in Science postdoctoral fellowship<sup>56</sup>
- Connecting researchers with AI expertise to domain experts to support the incorporation of AI into research projects. For example, a research staff member with computer vision expertise could work directly with a digital humanities scholar to digitize cultural artifacts
- Ensuring that AI experts are available for consultation by researchers to answer questions about AI use in publishing, grant writing, data security, general research conduct, and AI tool selection. These individuals could also be responsible for maintaining up-to-date FAQ or guidelines documents as the AI landscape evolves, and keeping the U of T community regularly updated about AI opportunities and successful uses.
- Supporting AI information sharing networks among faculty and other researchers

#### Build and support research data and computing infrastructure. This could include:

- Creating a large-scale computer cluster with significant GPU capacity beyond what is available through public sources
- Recruiting exceptional AI experts, leveraging the appeal of our AI-focused units, research centres such as Schwartz Reisman Institute for Technology & Society or T-CAIREM, and close partners such as the Vector Institute
- Building the AI-ready technology and data infrastructure under discussion by the Technology, Data Governance, and Digital Trust Working Group

## 6.6 Communicating change with the community

Given the pace of change in AI and its potential impact on research activities, effective communication channels about developments in AI are essential.

Changes to institutional policies, processes, resources, or other areas of importance that affect research can be shared in leadership forums like Principals, Deans, Academic Directors, and Chairs (PDAD&C) and include consultation with relevant stakeholders to ensure that all perspectives are considered and addressed.

Lower-stakes updates about new AI tools, training sessions, and similar items can be shared through regular webinars and newsletters. Additionally, platforms such as U of T Bulletin Brief articles, Research Alerts, and Centre for Research & Innovation Support newsletters can be used to disseminate this information.

Al-related documents, such as guidelines and training material, can be collected and made readily discoverable available online (e.g., through ai.utoronto.ca or a SharePoint site).

<sup>55</sup> Canadian Institute for Advanced Research. (n.d.). *CIFAR NextGen AI Training Programs Programs*. https://cifar.ca/topics/cifar-pan-canadian-ai-strategy/cifar-nextgen-ai-training-programs/

<sup>56</sup> University of Toronto. (n.d.). Eric and Wendy Schmidt Ai in Science Postdoctoral Fellowship. https://schmidtfellows.utoronto.ca/

# 7. Conclusion

We are excited by the promise for AI to advance the depth and quality of research at U of T, and for U of T to lead the research community in the responsible adoption of AI to support research and research administration in line with our institutional and community values.

To realize this potential, we need individual researchers to identify ways to leverage AI to enhance their research; U of T to support researchers' responsible use of AI; institutional commitments in professional development, research administration and technology; and engagement with local and international research communities to establish norms and align practices.

We're grateful to all those who provided input and feedback in discussions and consultations with the Working Group. The continued engagement of U of T's research community will be essential to what will be an ongoing process of negotiating the role of AI in our research processes and approaches in the years to come.

## **Appendices**

## **Appendix A: Selected research and reports**

The following reports provide a broad overview of considerations for AI in research. Additional sources are provided as references throughout the report.

*Artificial Intelligence: Considerations for Graduate Research.* (2024). Ontario Council on Graduate Studies. <u>https://cou.ca/wp-content/uploads/2024/10/OCGS-AI-graduate-research-considerations-FN-Oct-1-2024.pdf</u>

Artificial Intelligence in Science. (2023, June 25). OECD. <u>https://www.oecd.org/en/publications/</u> artificial-intelligence-in-science\_a8d820bd-en.html

Artificial Intelligence: Redefining the Future of Psychology. (2025). American Psychological Association. Blau, W., Cerf, V. G., Enriquez, J., Francisco, J. S., Gasser, U., Gray, M. L., Greaves, M., Grosz, B. J., Jamieson, K. H., Haug, G. H., Hennessy, J. L., Horvitz, E., Kaiser, D. I., London, A. J., Lovell-Badge, R., McNutt, M. K., Minow, M., Mitchell, T. M., Ness, S., ... Witherell, M. (2024). Protecting scientific integrity in an age of generative AI. Proceedings of the National Academy of Sciences, 121(22), e2407886121. https://doi.org/10.1073/pnas.2407886121

Chen, Z., Chen, C., Yang, G., He, X., Chi, X., Zeng, Z., & Chen, X. (2024). Research integrity in the era of artificial intelligence: Challenges and responses. *Medicine*, *103*(27), e38811. <u>https://doi.org/10.1097/</u> MD.00000000038811

Generative AI Considerations in Academic Research. (n.d.). *Centre for Research and Innovation Support*. <u>https://cris.utoronto.ca/guides/genai\_considerations/</u>

Generative AI in Academic Research: Perspectives and Cultural Norms—*Research & Innovation*. (2023, December 15). Cornell University. Retrieved February 21, 2025, from <u>https://research-and-innovation.cornell.edu/generative-ai-in-academic-research/</u>

*Indigenous data stewardship stands against extractivist AI.* (2024, June 18). UBC Faculty of Arts. <u>https://arts.ubc.ca/news/indigenous-data-stewardship-stands-against-extractivist-ai/</u>

Mollick, E. (2024, May 26). *Four Singularities for Research*. <u>https://www.oneusefulthing.org/p/four-singularities-for-research</u>

Naddaf, M. (2025). How are researchers using Al? Survey reveals pros and cons for science. *Nature*. <u>https://doi.org/10.1038/d41586-025-00343-5</u>

*Reminder of the Importance of Research Integrity & Use of AI.* (n.d.). University of Virginia Office of the Vice President for Research. <u>https://compliance.research.virginia.edu/about/integrity-and-ethics/</u> <u>reminder-importance-research-integrity-use-ai</u>

*Researchers and AI: Survey Findings*. (n.d.). Oxford Academic. <u>https://academic.oup.com/pages/ai-survey-findings</u>

Resnik, D. B., & Hosseini, M. (2024). The ethics of using artificial intelligence in scientific research: New guidance needed for a new tool. *AI and Ethics*, 1–23. <u>https://doi.org/10.1007/s43681-024-00493-8</u>

*Science in the age of AI.* (2024, May). Royal Society. <u>https://royalsociety.org/news-resources/projects/</u> <u>science-in-the-age-of-ai/</u>

### Appendix B: List of generative AI tools and research use examples

Below, we review AI-based tools to offer some examples of different types of AI tools and capabilities. We organize the tools as basic, intermediate or advanced to reflect the level of technical expertise or support required to implement the tool.

These examples are intended to offer insight into the AI tools and capabilities currently available to researchers, and to encourage researchers to explore tools that might be of use to them in their research. However, note that these tools are emerging and evolving, and most of the tools included below have not been vetted by the University for use with institutional or research data. Researchers should follow the guidelines from U of T's Information Security Office addressing how to "Use artificial intelligence intelligently" and the recommendations of this report when exploring potential tools.

#### **Basic tools**

Basic GenAl tools are user-friendly and require minimal technical expertise. They are often designed for accessibility and cater to researchers who need quick, straightforward solutions.

- ChatGPT, Claude, Gemini, CoPilot or similar conversational AI platforms: These tools can assist in drafting text, brainstorming ideas, or answering specific quantitative or qualitative questions. For example, researchers in social sciences might use tools like these to develop interview prompts, while computational optimization researchers might generate draft pseudo-code for algorithms.
- **Grammarly with GenAl tools**: Provides real-time grammar, spelling, and style suggestions. It can assist researchers in refining academic writing and ensuring clarity and coherence in manuscripts or proposals.
- Notion AI: Assists in task management and providing AI-generated summaries or brainstorming assistance, particularly helpful during collaborative research planning.
- Canva's Al design features (also Designer in PowerPoint): Useful for generating simple visual content such as posters or presentations more effectively. A researcher preparing for a conference presentation could use Canva's Al to create visually appealing slides highlighting their findings.
- Al writing assistants (many available; see <a href="https://theresanaiforthat.com/">https://theresanaiforthat.com/</a>): Among other capabilities, these tools can paraphrase and summarize text, particularly useful for literature reviews or when preparing abstracts for journal submissions, and offer style and grammar suggestions
- **DALL-E and Imagen**: Used for generating custom images or graphics based on textual input. A social scientist could use it to create visual representations of survey data, or a computational researcher might illustrate complex network structures.

#### **Intermediate tools**

Intermediate tools offer more specialized capabilities and often require a moderate level of familiarity with AI concepts or additional customization to meet specific research needs.

- ScopusAl (available through U of T Libraries): Supports literature search by generating summaries, finding related articles, and identifying "foundational" papers for a topic
- **ResearchRabbit**: Discovers related research papers and builds a network of interconnected research papers
- Mendeley with Al tools: Enhances reference management by suggesting related articles and offering intelligent recommendations for building comprehensive bibliographies
- Zotero with Al plugins: Helps automate citation management and organize references intelligently.
   For example, an interdisciplinary researcher might use it to efficiently manage references from multiple fields.
- **Scite.ai**: An Al-powered tool for citation analysis and research trend tracking. Physical sciences researchers could use it to identify key papers in emerging fields like quantum computing.
- Semantic Scholar's Al functions: Facilitates finding and summarizing academic papers
- **Overleaf with AI add-ons**: Streamlines LaTeX document creation with real-time suggestions. This is useful for researchers preparing mathematical proofs or formatting complex equations in physics or mathematics.
- GitHub Co-pilot: Assists in code generation, debugging, and providing programming suggestions tailored to specific tasks. For instance, researchers can use it to implement simulation models or optimize code for large-scale experiments.
- **IBM Watson Discovery**: Provides advanced text analytics and natural language processing capabilities to extract insights from unstructured academic data, making it a valuable tool for systematic reviews or research trend analysis
- **Google NotebookLM**: Provides quick AI summarization and note taking of text, YouTube videos, audio, PDF files and websites the user saves in a notebook

#### **Advanced tools**

Advanced generative AI tools cater to specialized research tasks and typically require technical expertise, such as programming skills, to leverage their full potential.

- **Hugging Face**: A hub for pre-trained models and libraries, Hugging Face facilitates building and fine-tuning AI models across a variety of tasks. Computational researchers can use it to implement state-of-the-art natural language processing pipelines, while social scientists may use its models for sentiment analysis or topic modelling in large text corpora.
- **GPT-4 fine-tuning frameworks**: Allows customization of language models based on a specific dataset that the researcher provides. For example, social science researchers may fine-tune a model to analyze sentiment in historical texts more accurately, while physical scientists could train it for specialized technical writing based on other existing works in the field.
- Ollama: Provides a streamlined platform for running and fine-tuning local language models securely and efficiently. While this requires more computational resources it has the benefit of locally running in the researcher's computer, with no external data sharing. For instance, researchers with privacy concerns can use Ollama to run models locally for tasks like personalized data analysis or domain-specific text generation.
- OpenAl Codex: Assists in generating code snippets or debugging complex programming problems
- AlphaFold: Revolutionizes biological research by predicting protein structures with high accuracy. A biophysicist could use AlphaFold to understand the structural dynamics of a protein related to disease mechanisms.
- GANs (Generative Adversarial Networks): GANs are a foundational generative Al technique. They work by employing two neural networks—a generator and a discriminator—that compete with one another to create realistic synthetic data. GANs are widely used in various fields:
  - In **social sciences**, GANs can generate synthetic demographic datasets to test hypotheses without compromising sensitive personal data
  - In physical sciences, researchers use GANs to simulate data for experiments in areas like material science or astrophysics, such as generating high-resolution images of celestial bodies
  - In **computational optimization**, GANs are applied to create synthetic benchmarks for testing optimization algorithms under diverse conditions
  - In **biomedical research**, GANs help generate realistic medical imaging datasets, aiding in training AI models where labeled data might be limited

#### **Additional tools**

Below we offer further comments on specific tools; note that software is evolving rapidly, and the examples provided here represent a snapshot of current capabilities rather than a comprehensive list.

Tool	Proficiency required	How it helps in research	Examples of use in research	Trade-offs	Link
ChatGPT/ OpenAl GPT	Beginner	Drafting, brainstorming, summarizing, coding assistance, and idea exploration	Drafting sections of papers, brainstorming research questions, summarizing papers, or debugging code for data analysis	Limited real-time web access (in free version) may miss cutting-edge or specific data	<u>https://openai.</u> com/
Claude (Anthropic)	Beginner	Contextualized summarization, writing, and interactive brainstorming	Summarizing long research papers or datasets, generating outlines for literature reviews, and asking context-aware follow- up questions about research problems	Struggles with complex, domain- specific reasoning compared to some competitors	https://www. anthropic.com/
Google Gemini	Beginner	Quick information retrieval, real-time data exploration, and advanced reasoning	Gathering recent research trends, generating summaries, or debugging code snippets	Newer to the market; integration with niche research tools and datasets may be limited	https://gemini. google.com/
Google Gemini Deep Researcher	Beginner/ Intermediate	Agentic feature in Gemini Pro version; includes all features plus additional research-specific tools	Automating literature reviews by extracting key insights from multiple papers, identifying trends in research topics, and conducting detailed natural language searches over a dataset	Requires subscription and dependent on Google's ecosystem to manage papers / organize documents	https://blog. google/products/ gemini/google- gemini-deep- research/
Scite.ai	Beginner	Finding citations, tracking citation contexts, and validating references	Locating papers supporting or contrasting a hypothesis, exploring citation networks, and checking evidence supporting key claims	Focused on citation contexts, less versatile for non- bibliographic tasks	<u>https://scite.ai/</u>
Perplexity AI	Beginner	Literature reviews, summarizing research trends, and advanced question-answering	Compiling an overview of a field, answering specific questions about papers, and discovering research gaps	Limited to pre-trained knowledge and may miss nuanced domain-specific insights	<u>https://www.</u> perplexity.ai/

ΤοοΙ	Proficiency required	How it helps in research	Examples of use in research	Trade-offs	Link
Elicit	Beginner	Research synthesis, literature review assistance, and identifying key papers for systematic reviews	Generating evidence tables for systematic reviews, identifying gaps in literature, or generating summaries of paper methodologies	Best suited for structured research; limited for unstructured tasks like exploratory brainstorming	https://elicit.org/
NotebookLM	Beginner to Intermediate	An Al-first research notebook that helps researchers summarize and explore their uploaded files and notes	Summarizing a dataset, brainstorming hypotheses based on uploaded notes, and querying a corpus of your research for quick insights	Limited availability and integration with broader research workflows	https:// notebooklm. google.com/
Grammarly	Beginner	Grammar, tone, and style improvement for research manuscripts and emails	Polishing manuscript drafts, ensuring professional tone in funding proposals, and avoiding plagiarism in rephrasing	Focuses on language; limited help with technical, field- specific terminology	<u>https://www.</u> grammarly.com/
Writefull	Beginner	Grammar, vocabulary, and clarity improvements for academic texts	Checking for appropriate academic language, simplifying overly complex sentences, and improving word choice for clarity in technical texts	Narrow focus on language; not useful for idea generation or research tasks	<u>https://writefull.</u> com/
Research Rabbit	Beginner	Discovering related research papers, building literature maps, and exploring citations	Building a network of interconnected research papers, identifying potential collaborators, and discovering overlooked papers in a field	Limited to literature discovery; does not assist with manuscript creation or summarization	<u>https://www.</u> <u>researchrabbitapp.</u> com/
DeepL Write	Beginner	Refining writing style, improving text coherence, and paraphrasing sentences	Rephrasing awkward sentences in research drafts, improving flow in technical abstracts, or adapting language for different audiences	Limited field- specific terminology optimization; less comprehensive than Grammarly for overall grammar	https://www. deepl.com/write
ChatPDF	Beginner	Interacting with and summarizing academic papers in PDF format	Asking specific questions about a PDF research paper, summarizing the key sections, or quickly identifying relevant content	Works only with PDF files and is limited to provided document data	https://www. chatpdf.com/

#### Appendices

Tool	Proficiency required	How it helps in research	Examples of use in research	Trade-offs	Link
SciSpace Copilot	Beginner	Explaining complex research concepts, summarizing papers, and simplifying scientific jargon	Decoding highly technical research terminology, generating plain- English summaries for interdisciplinary collaborations, and answering questions about methodology in specific papers	Struggles with non-English papers and niche domain content	<u>https://typeset.io/</u>
Canva Al	Beginner	Designing research posters, data visualizations, and presentation slides with ease	Creating academic conference posters, designing infographics for research results, or improving the visual appeal of presentation decks	Limited data visualization precision compared to dedicated analytics tools like Tableau	<u>https://www.</u> <u>canva.com/</u>
DALL-E 3	Beginner	Generating visuals and illustrations for research presentations or publications	Creating custom visual diagrams, concept illustrations for papers, or engaging visuals for public presentations	May require prompts tailored to research contexts; limited for complex scientific visualizations	<u>https://openai.</u> <u>com/dall-e</u>
Microsoft Copilot	Intermediate	Integrated assistance for summarizing, drafting, and analyzing data within Microsoft products	Drafting reports in Word, creating presentations in PowerPoint, or analyzing data trends in Excel	Limited to Microsoft ecosystem; requires subscription to use full features	https://www. microsoft. com/en-us/ microsoft-365/ copilot
Zotero + Al Plugins	Intermediate	Automatic literature categorization, citation management, and paper summarization with AI plugins	Generating bibliographies, organizing papers by topic, and automatically extracting abstracts for faster reviews	Requires installation and setup; plugins may have a learning curve	<u>https://www.</u> zotero.org/
DataRobot	Intermediate to Advanced	Building predictive models, automating data analysis, and deriving insights from research data	Automating machine learning pipelines, evaluating predictive models for empirical studies, and exploring feature importance in datasets	Expensive for small- scale research; requires domain knowledge for effective use	<u>https://www.</u> datarobot.com/
Mathematica + Wolfram Alpha	Intermediate	Advanced mathematical computations, symbolic reasoning, and dynamic visualization of research data	Solving complex mathematical equations, simulating dynamic systems, and creating visualizations for differential equations or experimental data	Costly licenses; limited usability for non-mathematical tasks	https://www. wolfram.com/

#### Appendices

Tool	Proficiency required	How it helps in research	Examples of use in research	Trade-offs	Link
Tableau + GPT	Intermediate	Automating data visualization insights and customizing dashboards using generative Al	Generating dashboards with automated trend detection, customizing charts with specific requirements, or quickly summarizing insights from complex datasets	Subscription costs; may not directly support highly complex statistical analyses	https://www. tableau.com/
Hugging Face	Advanced	Accessing state- of-the-art machine learning models, natural language processing, and fine- tuning for specific research tasks	Fine-tuning NLP models for text classification, generating synthetic data, or analyzing sentiment in qualitative data	High learning curve for non-technical users and may require coding expertise	<u>https://</u> huggingface.co/
IBM Watson Discovery	Advanced	Extracting insights from unstructured data, automating document reviews, and text mining	Analyzing qualitative data for common themes, performing sentiment analysis on surveys, and automating content classification	Expensive and requires integration effort for niche applications	<u>https://www.ibm.</u> com/watson

## **Appendix C: Excerpts from funding organization policies**

These policies are emergent and evolving and researchers should review funder statements to ensure they are up to date with expectations.

#### **Canadian funding organizations**

Government of Canada: Guidance on the use of Artificial Intelligence in the development and review of research grant proposals

https://science.gc.ca/site/science/en/interagency-research-funding/policies-and-guidelines/usegenerative-artificial-intelligence-development-and-review-research-proposals/guidance-use-artificialintelligence-development-and-review-research-grant-proposals

#### Usage of generative AI

Before using any AI tool, applicants and reviewers should carefully review the following points to assess if the tool leverages generative AI and therefore, if this guidance applies.

- The agencies acknowledge that the definition of generative AI is fluid and evolving due to the speed with which the technology is changing. Nevertheless, the agencies recognize the four important properties of generative AI systems:
  - 1. Generative AI systems present a straightforward, often conversational, interface that makes deploying the power of the system accessible to a broad range of non-expert users.
  - 2. Generative AI systems intrinsically enable iterative design and improvement processes.
  - **3.** Generative AI systems make available information extracted from enormous amounts of data and computing power.
  - **4.** The output of the generative AI systems approaches a level of sophistication that may cause non-experts to erroneously identify the output as having been created by humans.
- Applicants are responsible for ensuring that information included in their grant applications is true, accurate and complete and that all sources are appropriately acknowledged and referenced. Applicants must state if and how generative AI has been used in the development of their application and are required to follow specific instructions, which will be provided for each funding opportunity as they become available.
- In the evaluation of grant applications, reviewers should be aware that inputting application
  information into generative AI tools could result in breaches of privacy and in the loss of custody of
  intellectual property. Use of publicly available generative AI tools for evaluating grant applications is
  strictly prohibited.

#### CIHR: Policy Statement on the use of artificial intelligence-based technology in peer review meetings

#### https://cihr-irsc.gc.ca/e/54129.html

# CIHR has issued a policy statement to clarify its position on the **use of AI-based assistants and** transcription technology in peer review meetings.

 All meeting participants - whether attending in person or virtually—are prohibited from using Albased software or applications that automatically transcribe and/or summarize spoken dialogue. This restriction extends to pre- and post- meeting discussions related to funding applications. Exceptions for disability accommodation will require CIHR approval in advance of the meeting

#### International funders

Researchers at the University of Toronto are funded through a variety of sources, a large proportion of which comes from U.S. and International funders. While it is not our intention to list all international policies, we highlight two examples to demonstrate approaches to demonstrate nuance in policy expectation internationally.

#### National Institutes of Health (USA): Artificial intelligence in research: policy considerations and guidance

#### https://osp.od.nih.gov/policies/artificial-intelligence

NIH has a robust system of policies and practices that guide stakeholders across the biomedical and behavioral research ecosystem. While AI may not be explicitly mentioned, NIH's policy framework is designed to responsibly guide and govern advancing science and emerging technologies, including development and use of AI technologies in research. NIH highlights considerations in:

- Research participant protections
- Data management and sharing
- Health information privacy
- · Licensing, intellectual property and technology transfer
- Peer review
- · Biosecurity and biosafety

NIH prohibits peer reviewers from using natural language processors, large language models, or other generative AI technologies for analyzing and formulating peer review critiques for grant applications and R&D contract proposals.

All NIH Peer Reviewers are also required to sign and submit a modified Security, Confidentiality and Nondisclosure Agreement certifying that they fully understand and will comply with the confidential nature of the review process, including the prohibition on uploading or sharing content or original concepts from an NIH grant application, R&D contract proposal, or critique to online generative AI tools.

# Wellcome (UK): Use of generative artificial intelligence (AI) when applying for Wellcome grant funding

#### https://wellcome.org/grant-funding/guidance/policies-grant-conditions/use-of-generative-ai

Wellcome is a signatory of the Funders joint statement on the use of generative AI tools. The expectations for researchers are also similar to current Canadian policy:

- When developing funding proposals, researchers must ensure generative AI tools are used responsibly and in accordance with relevant legal and ethical standards where these exist or as they develop. As best practice, any outputs from generative AI tools in funding applications should be acknowledged. Where individual funders wish to apply further specific restrictions, this will be explicitly stated.
- Maintaining confidentiality is essential for safeguarding the exchange of scientific opinions and assessments. As such, peer reviewers must not input content from confidential funding applications or reviews into, or use, generative AI tools to develop their peer review critiques or applicant responses to critiques.

Wellcome's policy on generative AI also places requirements on institutions to provide guidance to their staff on the responsible use of AI tools. This includes ensuring that AI-generated outputs are valid and do not contain false or misleading information.

#### For more information, please contact:

ai.taskforce@utoronto.ca https://ai.utoronto.ca/

![](_page_35_Picture_2.jpeg)

![](_page_35_Picture_3.jpeg)