Responsible Use of AI in Research

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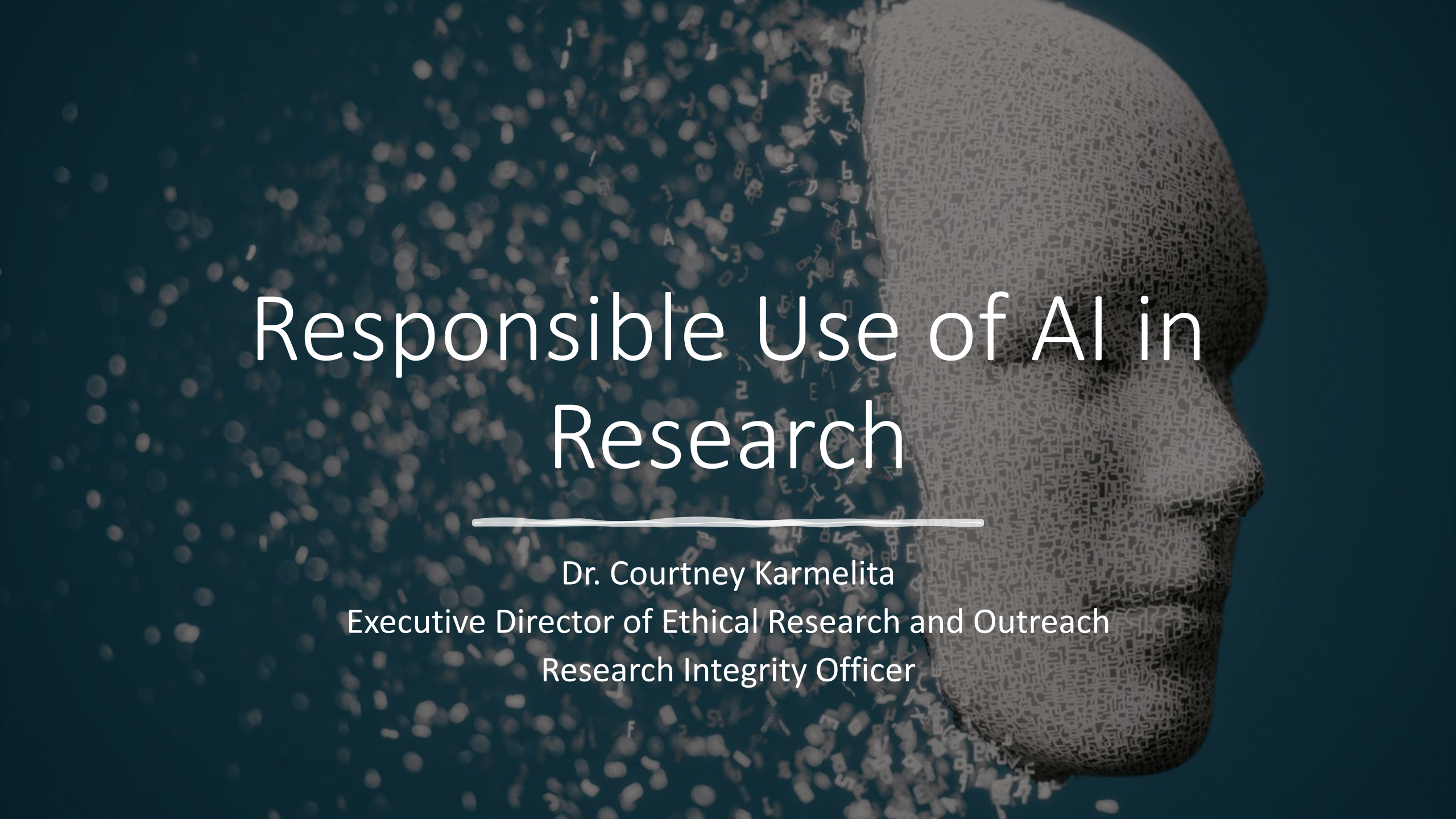

Responsible Use of AI in Research

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Research Integrity Officer

Presentation Overview

- Common misconceptions
- General landscape of AI policies & guidance
- Appropriate use of AI
- Approaches to compliance
- Case studies
- Resources

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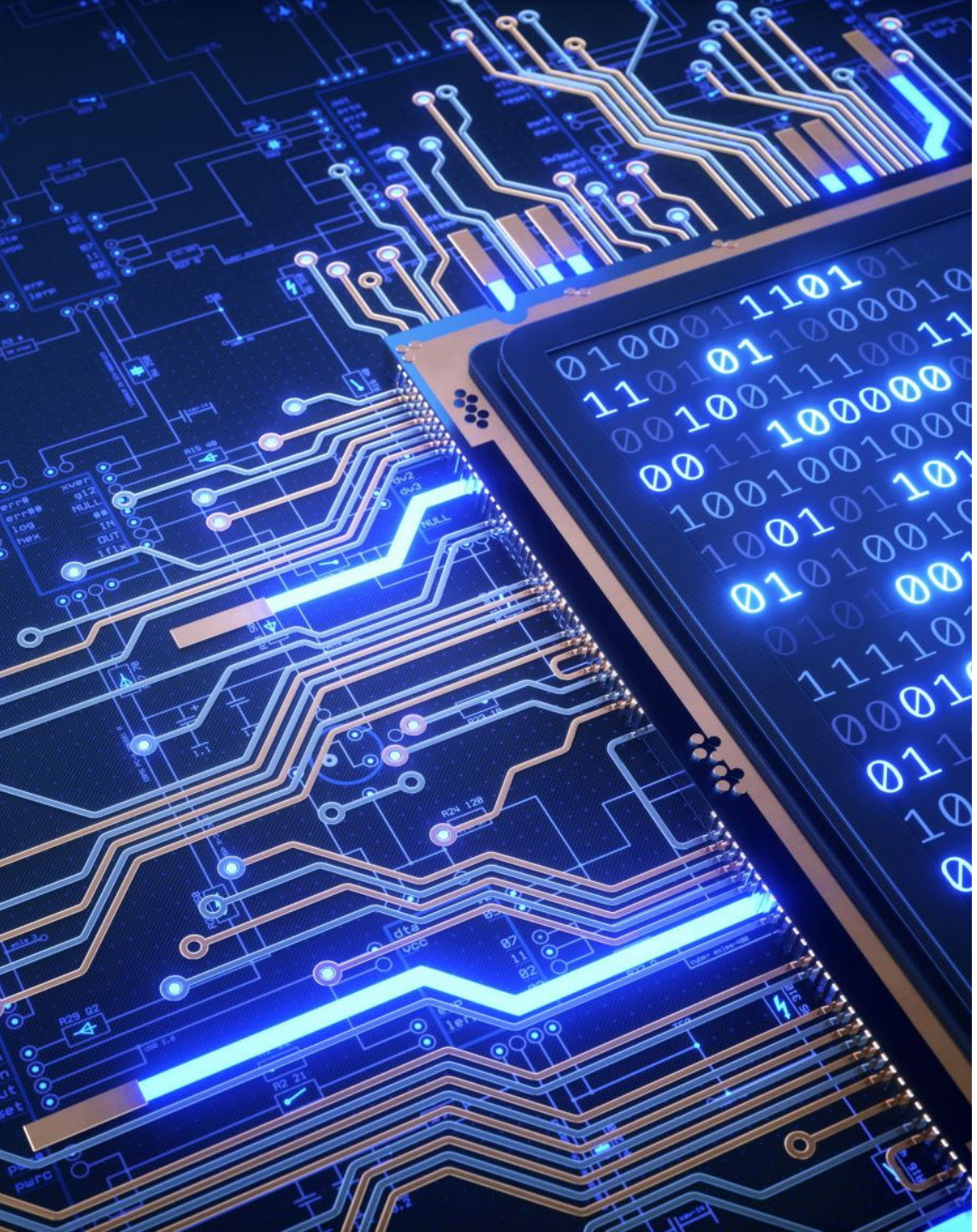

Misconception: Use of AI Should Be Avoided

- **Truth:** Integrity issues in science existed well before AI. It is a tool and can be appropriately used. Other disruptive technologies required regulation, education and a framework for use
  - Calculator
  - Spell check
  - GPS
  - Smart phones

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Misconception: We Lack a Framework

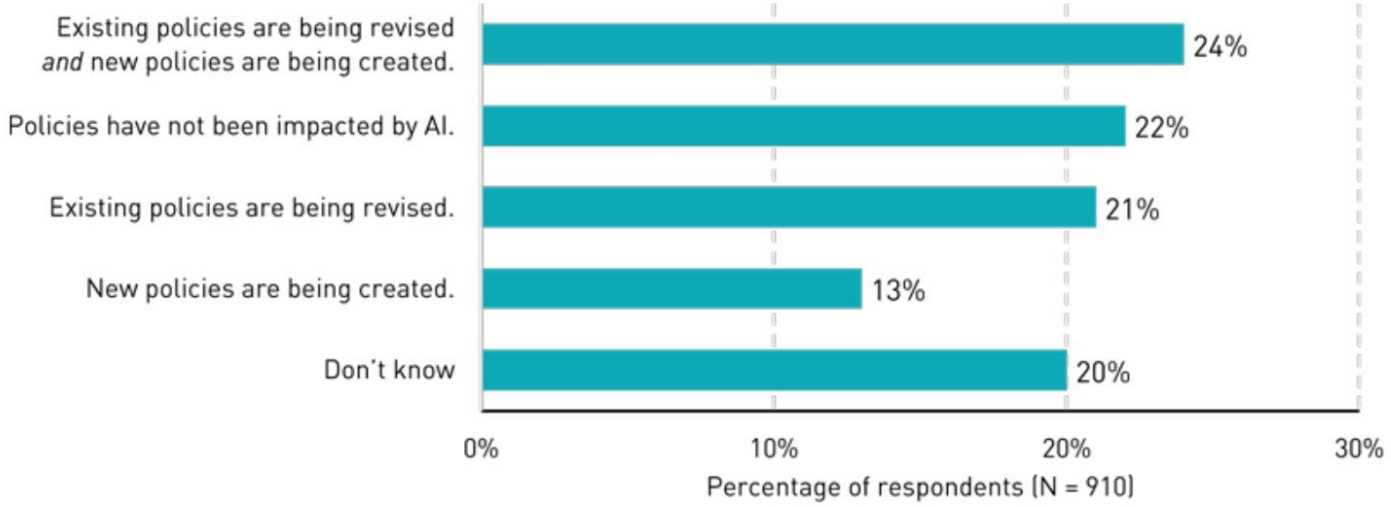
- **Truth:** There are existing policies, guidelines, and decision-making models that we can adopt

Institutional Landscape

2024 EDUCAUSE AI Landscape Study,

Policies and Procedures

Impact of AI on Institutional Policies



Institutional policies are being revised and created to address AI-related issues.

Establishing AI Policy & Guidelines

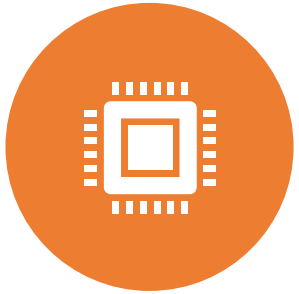
- Journals and publication societies
  - COPE (Committee on Publication Ethics)
  - International Society for Medical Publication Professionals
- Professional societies/organizations and nonprofits
  - American Geophysical Union
  - Association of Clinical Research Professionals
  - EDUCAUSE
  - PRIM&R (Public Responsibility in Medicine and Research)
- Belmont Report

Authorship and Peer Review

- Not appropriate for authorship and peer review
  - AI is a tool, not a replacement for human creation and thought
  - “no human, no AI”- ARL
- Meet all other scientific standards such as rigor and reproducibility
- Maintain confidentiality and data privacy
- Take primary responsibility for data in publications

Note: Every journal has different expectations that the researcher is responsible for knowing.

Other Applicable Policies



Does inputting code into an AI tool violate the license agreement? (IP)

Does the data have privacy issues or security concerns? (HIPAA & FERPA)

Does the use of generative AI deviate an approved protocol? (IRB)

What are the limitations per funder or sponsor? (NIH)

General Principles

Build awareness on responsible use of AI

Know the impacted stakeholders

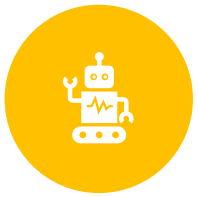
Follow existing policies & best practices

Disclose its use; be transparent

Verify information

Account for bias and limitations

Maintain data integrity



Use AI as a tool, not a replacement for human creation and thought

Educate

Establish expectations for use

Know the limitations of using AI

Be aware of the potential risks

Data privacy & interference (breach of confidentiality)

Biases

Deepfakes

Consult with subject matter experts

Understand the differences among AI tools

Grammarly vs chatGPT

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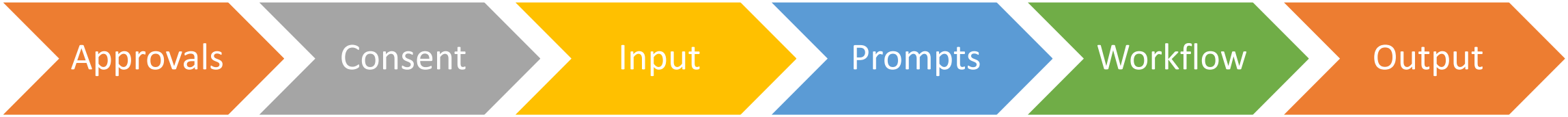
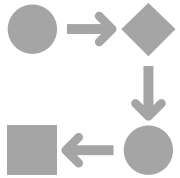
Document the Process



Use Best Practices for Managing Data

Maintain data provenance



Follow leading community principles such as:

Findable, Accessible, Interoperable, and Reusable (FAIR)

Collective Benefit, Authority to Control, Responsibility, and Ethics (CARE)

Transparency, Responsibility, User Focus, Sustainability, and Technology (TRUST)

Satisfy data security requirements

Verify Data

- Check source material
- Fact-check key points
- Look for consistency and contradictions
- Ensure the work is reproducible

Account for Bias and Limitations

“inherent susceptibility of all AI to distortion”

Explain the interpretation of the data

Include discussion of limitations

Assess validity and trustworthiness

Limits of AI

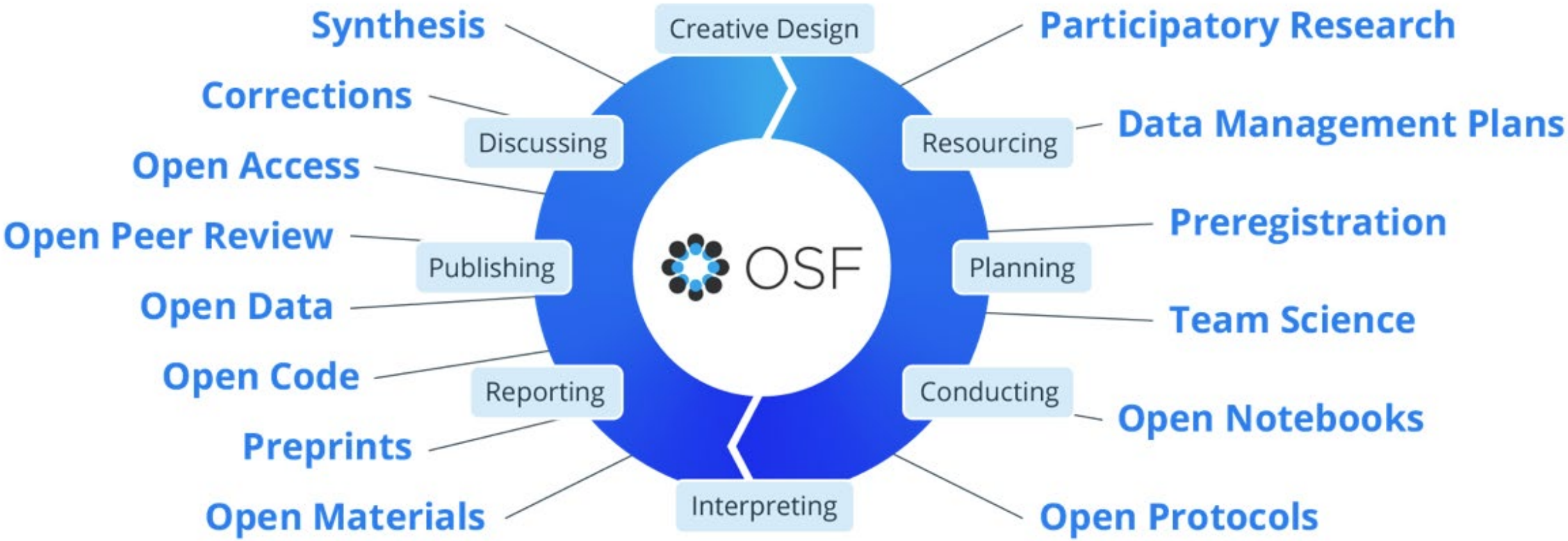
- Designed to predict the next word, not think through ethical issues.
  - Desire to answer the prompt
  - Hallucinations
- Quality and validity of the input
  - What source is it pulling from?
  - Is the source the most up-to-date?
- Bias
  - Trained on text-based human conversations, and some of that data may be inaccurate, untruthful, and otherwise misleading at times.
- Lack of intuition or human knowing

Beyond Conducting Research

- Same principles apply when reviewing, proposing or publishing research, not just conducting it
- Not appropriate for authorship of and peer review
- Not appropriate for foundational thought or entire drafting of proposals and protocols
- PIs still have primary responsibility for compliance and integrity (data, protocols, consent, etc.)

Note: Every journal has different expectations that the researcher is responsible for knowing.

Disclose Use and Be Transparent



Bloom's Taxonomy

Oregon State University Ecampus

Bloom's Taxonomy Revisited

Use this table as a reference for evaluating and considering changes to aligned course activities (or, where possible, learning outcomes) that emphasize distinctive human skills and/or integrate generative AI (GenAI) tools as a supplement to the learning process.

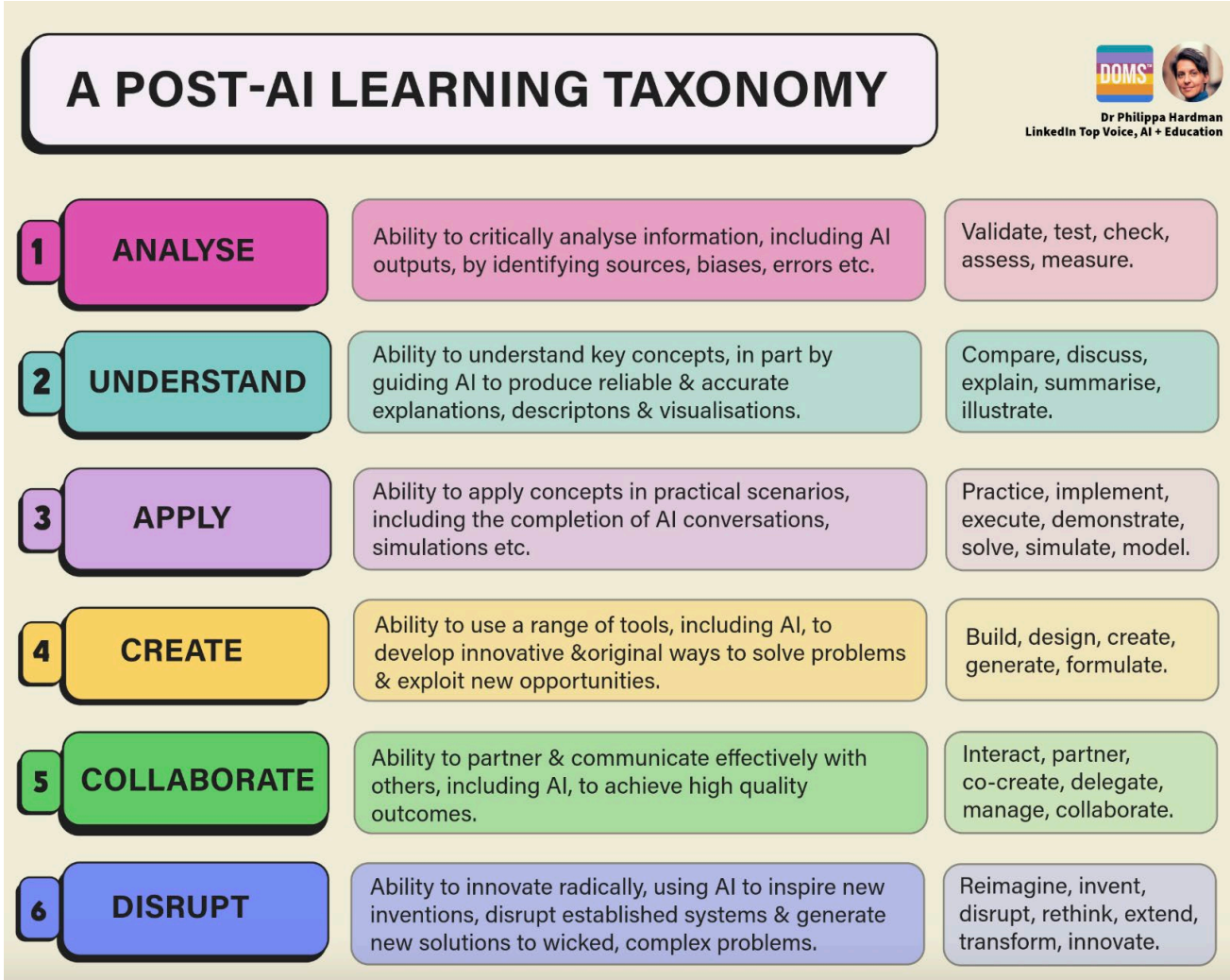
All course activities and assessments will benefit from ongoing review given the evolving capabilities of GenAI tools.

Version 2.0 (2024)

	Distinctive Human Skills	How GenAI Can Supplement Learning*
CREATE	Engage in both creative and cognitive processes that leverage human lived experiences, social-emotional interactions, intuition, reflection, and judgment to formulate original solutions	Support brainstorming processes; suggest a range of alternatives; enumerate potential drawbacks and advantages; describe successful real-world cases; create a tangible deliverable based on human inputs
EVALUATE	Engage in metacognitive reflection; holistically appraise ethical consequences of other courses of action; identify significance or situate within a full historical or disciplinary context	Identify pros and cons of various courses of action; develop and check against evaluation rubrics
ANALYZE	Critically think and reason within the cognitive and affective domains; justify analysis in depth and with clarity	Compare and contrast data, infer trends and themes in a narrowly-defined context; compute; predict; interpret and relate to real-world problems, decisions, and choices
APPLY	Operate, implement, conduct, execute, experiment, and test in the real world; apply human creativity and imagination to idea and solution development	Make use of a process, model, or method to solve a quantitative or qualitative inquiry; assist students in determining where they went wrong while solving a problem
UNDERSTAND	Contextualize answers within emotional, moral, or ethical considerations; select relevant information; explain significance	Accurately describe a concept in different words; recognize a related example; translate to another language
REMEMBER	Recall information in situations where technology is not readily accessible	Retrieve factual information; list possible answers; define a term; construct a basic chronology or timeline

*AI capabilities derived with reference to an analysis of the MAGE framework, based on ChatGPT 4 as of October 2023. See Zaphir, L., Lodge, J. M., Lisec, J., McGrath, D., & Khosravi, H. (2024). How critically can an AI think? A framework for evaluating the quality of thinking of generative artificial intelligence. arXiv preprint arXiv:2406.14769.

Revising Bloom's



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Ethical Decision-Making Framework

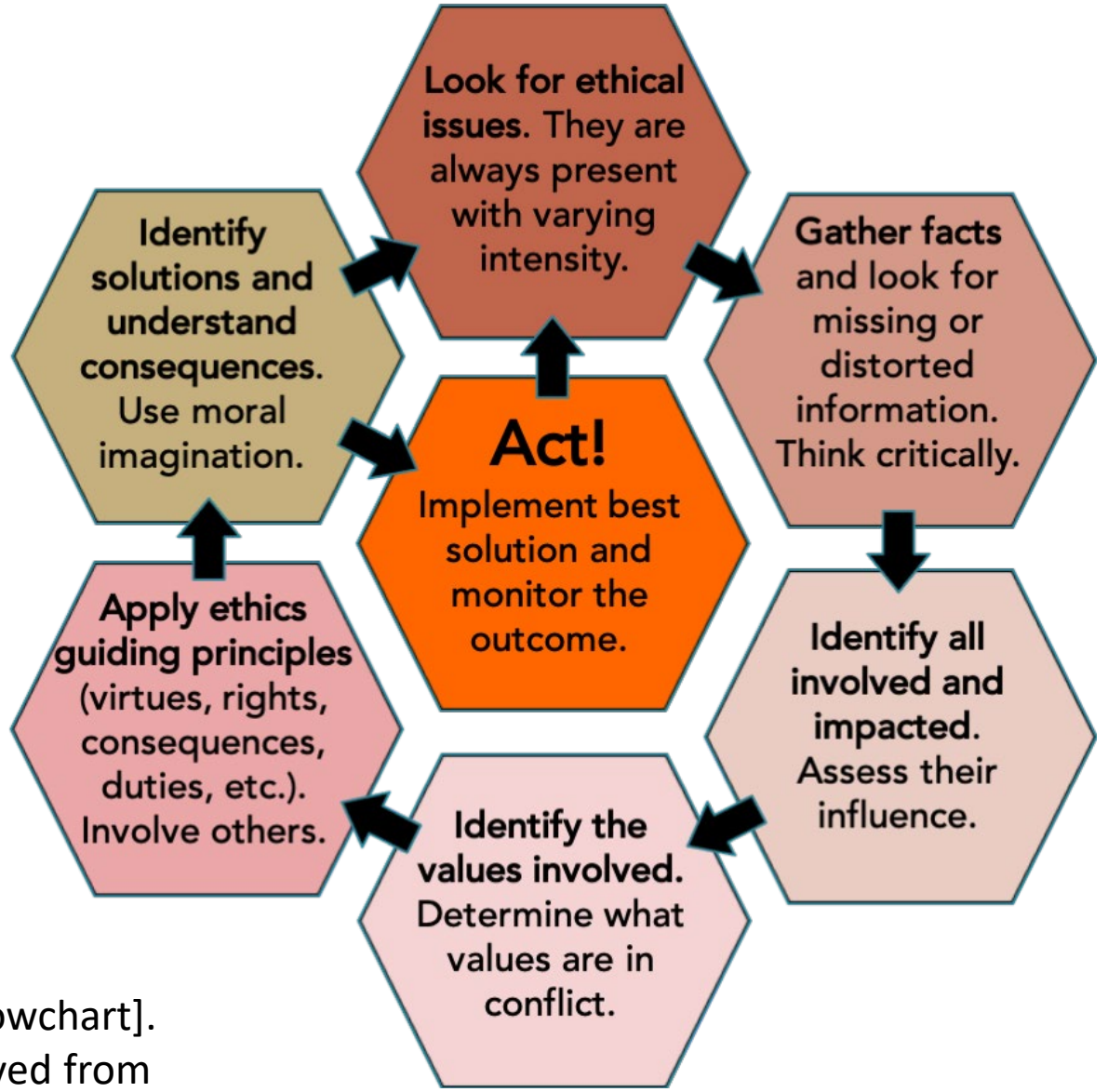

Image Created from: *Ethical decision Making Process* [Flowchart]. (2021). *Identifying and Analyzing an Ethical Issue*. Retrieved from https://www.physio-pedia.com/Identifying_and_Analysing_an_Ethical_Issue

Action ↓ / Principle →	**Human Agency & Oversight**	**Fairness & Non-Discrimination**	**Transparency & Explainability**	**Privacy & Data Governance**	**Accountability & Integrity**	**Societal & Environmental Impact**	**Sustainability & Continuous Evaluation**
Gather the Facts	Who is responsible for verifying the AI input and out? Why use AI for this project or research?	Are datasets inclusive? Do students have equal access to AI for assignments requiring its use?	Are methods for how AI was used and the outcomes clear?	What data is being used (consent, sensitivity)? Are there legal implications (e.g., FERPA, HIPAA, copyright, data privacy laws)?	What Penn State policies govern this work? Are the methods and outcomes clearly defined and transparent? Does the syllabus allow for use of AI for this assignment?	Are societal impacts considered? What risk does using AI pose in this instance?	How will use of AI be evaluated over the course or the project? Who are the domain experts (AI ethics, law, data management) that we can consult?
Determine the Ethical Issue	Is AI being used to replace human thought or to enhance/refine?	What biases may exist when using AI in this capacity?	Can non-experts understand the outcomes?	Are data risks identified and mitigated?	Are accountability structures clear?	Does fairness include environmental effects?	How do we check for evolving risks?
Consider Ethical Principles & Values	How does use of AI in this capacity align with PSU mission?	Does fairness mean equal access, treatment, or outcomes?	Does use respect transparency vs. confidentiality balance?	Does it respect dignity, privacy, and rights?	Does this reinforce ethical conduct long-term?	What values (equity, sustainability, trust) are at stake?	How will we revisit decisions in the future?
Identify Those Impacted	Who retains agency among affected groups?	Who might be marginalized or excluded?	How might public trust be shaped?	Whose data is being used and with what consent?	Who bears responsibility for harm?	How are staff, students, or the public affected?	How will we adapt based on stakeholder feedback?
Explore Solutions & Actions	How can humans remain accountable?	What alternatives reduce bias/exclusion?	How do we document decisions?	How do we protect privacy and dignity?	What oversight/training is required?	What short/long-term impacts will this have?	How do we evaluate and revise approaches?

Action	Guiding Questions	Recommended Actions	Stakeholder Differences
1. Gather the Facts	- How does the use of AI in this capacity support learning, decision-making, or discovery? - What kind of data is being used, and where does it come from? - Is the use of AI clearly explained to all involved? - What policies apply to this AI use? - What does the syllabus say about AI use for this assignment or project? - Are there legal concerns (FERPA for students, HIPAA for health data)?	- Clarify AI's role and benefits. - Identify data sources and consent requirements. - Ensure transparency in goals and methods. - Consult with compliance officers or ethics experts. - Document policy alignment. - Ensure all participants are informed.	**Students:** Seek clarity on data use and learning impact. Be aware of assignment expectations. **Faculty:** Focus on research and teaching enhancement. Define appropriate AI for students. **Staff:** Manage operational data and compliance **Administrators:** Ensure strategic alignment and policy adherence.
2. Determine the Ethical Issue	- Are we checking for bias in data or algorithms? - What does fairness mean in this setting—equal access, outcomes, or treatment? - Are we making assumptions about behavior or intelligence that could harm individuals?	- Audit for bias and discrimination. - Define fairness with input from affected groups. - Include diverse voices in design and review.	**Students & Faculty:** Consider how AI may have bias for this assignment or project. **Faculty:** Ensure equal access to AI for all students. **All:** Disclose the use of AI, including how it was used
3. Consider Ethical Principles	- Are we upholding Penn State values like integrity, respect, and excellence? - How do we balance conflicting values (e.g., transparency vs. confidentiality)? - Are we setting a positive example for future AI use?	- Use value-based decision-making. - Document ethical dilemmas and resolutions. - Encourage ethical leadership. -Promote responsible innovation.	**All:** Weigh the risks and benefits from using AI for each specific task against the core values
4. Identify Those Impacted	- Who is affected—students, staff, faculty, research participants, or the public? - Could this AI use disadvantage or exclude certain groups? - Have we consulted with those impacted, especially from underrepresented backgrounds?	- Conduct stakeholder analysis. - Engage diverse communities. - Monitor trust and reputation.	**Staff:** Adapt systems and engage in training **Administrators:** Evaluate institutional outcomes.
5. Explore Possible Solutions and Actions	- Are there more ethical or inclusive design choices? - How will we document and monitor AI decisions? - What training or oversight is needed for users and interpreters of AI?	- Choose ethical alternatives (e.g., open-source, less sensitive data). - Implement accountability and review processes. - Provide role-specific training.	**Faculty:** Adopt new teaching practices to capitalize on AI. **Students:** Use AI to enhance learning. **Staff and Administrators:** Use AI to streamline process.

Potential Compliance Approaches

- Embed Subject Matter Experts
- Form a separate review committee
- Use an ad hoc as needed approach
- Create points of contact for existing committees

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AI and Research Misconduct

Is it plagiarism?

Plagiarism is defined as the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

AI and Research Misconduct

- Use of AI to change an input to manipulate for the preferred outcome
- Without direction of the researcher, AI purposefully manipulates data to give what is perceives as a preferred response based on predicted pattern

Example of AI Limits

Prompt: “Write me a research paper which includes an introduction, methods, results, and conclusion section comparing the effectiveness and cost of Tofacitinib versus Methotrexate in treating Rheumatoid Arthritis using the MarketScan Database from 2012 to 2020 and give it a title.”

Response: “The Marketscan database was used to identify patients with RA who were treated with either tofacitinib or methotrexate from 2012 to 2020.”

Problem: Any guesses?

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10028415/

Appropriate vs Inappropriate Use

Appropriate Use Examples

Enhancement or refinement of a novel idea

Basic analysis/computation that can be verified

Inappropriate Use Examples

Analysis of identifiable human subject data

Draft an entire manuscript

Case Study

A graduate student used chatGPT to write the draft data analysis for a paper because she was feeling overwhelmed and did not have the time to meet the deadline. The PI offered feedback to the graduate student and based on the tone and writing style, asked the student whether or not chatGPT was used. The student admitted that she had “some help” from chatGPT. After further review of the manuscript the PI found made up references and citations. The PI further questioned the student who admitted to using chatGPT for the entire draft. The PI removed the student from the project.

Case Study

- A postdoc used chatGPT to analyze surveys of food preferences that they planned to use in an article. The postdoc set specific parameters for how the analysis was to be conducted and input the survey results. When submitting the article, the postdoc disclosed that chatGPT was used to identify trends in the surveys.

AI Resources

- Committee of Publication Ethics (COPE)
- World Association of Medical Editors (WAME)
- Reputable journals in your respective field
- UKRio
- Using AI tools in your writing
- NIH Office of Science Policy on AI
- Educause
- Stall, Shelley & Cervone, Guido & Coward, Caroline & Cutcher-Gershenfeld, Joel & Donaldson, Thomas & Erdmann, Chris & Hanson, R. & Holm, Jeanne & King, John & Lyon, Laura & MacNamara, Delia & McGovern, Amy & McGranaghan, Ryan & Narock, Ayris & Parker, Micaela & Peng, Ge & Rao, Yuhan & Ryan, Erin & Sedora, Brian & Participants, AGU. (2023). Ethical and Responsible Use of AI/ML in the Earth, Space, and Environmental Sciences. 10.22541/essoar.168132856.66485758/v1.

Take Aways

- Generative AI can be used as tool to enhance our work
- There is ALWAYS a need for human verification of the output but the input is equally important
- Good data management practices (like data provenance) are more important than ever
- You should disclose use of generative AI, particularly when publishing
- Be aware of the norms if your field and the expectations of your PI
- Know privacy and security restrictions for the data you are working with

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