Office of Research and Innovation (R&I)
Guiding Principles and Best Practices for AI in Research and Creative Activities at UNL

Introduction

The Office of Research and Innovation (R&I) at the University of Nebraska-Lincoln (UNL) recognizes the potential benefits of artificial intelligence (AI) to: advance knowledge, research, creative activities, and scholarly work; improve the speed of data analysis of large and complex datasets, augment human decision making, optimize performance for intricate tasks, and improve safety for people in dangerous situations; and promote innovation and economic growth. At the same time, the application of AI to complex problem-solving in real-world situations raises concerns about trustworthiness, bias, ethics, and potential disruptive effects on the U.S. workforce.

Over the last decade, the rapid evolution of AI, featuring innovative generative models such as ChatGPT, BARD, and DALL-E, has encountered varying degrees of societal acceptance, coupled with a notable absence of precise federal or state regulations. ***Recognizing these challenges, it becomes imperative for UNL employees and students to embrace guiding principles and best practices that are centered on fostering the responsible and ethical development, adoption, and use of AI in research and creative activities at UNL.*** Establishing a framework grounded in the appropriate ethical considerations will play a pivotal role in navigating the complexities and potential implications of AI technologies.

There is no single definition of AI that is universally accepted. While definitions of AI vary, for purposes of these guiding principles and best practices, the definition of AI from the National Institute of Standards and Technology (NIST) will be used. According to NIST, "*AI technologies and systems are considered to comprise software and/or hardware that can learn to solve complex problems, make predictions or undertake tasks that require human-like sensing (such as vision, speech, and touch), perception, cognition, planning, learning, communication, or physical action.*" The two powerful and dominant AI methods are:

- *Machine Learning (ML):* Machine Learning is a field of AI that uses algorithms and data to simulate the learning process observed in humans. Unlike traditional programming, ML does not rely on explicit programming rules. Instead, it harnesses the power of large datasets to enhance the accuracy and performance of algorithms through iterative learning. This approach enables systems to improve their predictive capabilities, adapt to patterns in data, and make informed decisions without being explicitly programmed for each scenario.
- *Deep Learning (DL):* Deep Learning is a specialized subset of ML that emphasizes the use of neural networks with multiple layers (deep neural networks) to model and solve complex problems. It leverages hierarchical representations of data and automatically extracts relevant features at various levels of abstraction. Deep Learning is particularly potent in tasks involving large volumes of unstructured data, such as image and speech recognition, and is characterized by its ability to automatically learn intricate patterns and representations from raw data.

Examples of ML- and DL-based AI technologies include:

- *Computer Vision (CV):* Computer vision focuses on enabling machines to gain an understanding of visual information from the world, such as images and videos. It involves tasks such as image recognition, object detection, image segmentation, and facial recognition. Examples where CV plays a crucial role include autonomous vehicles, medical imaging, and augmented reality.
- *Health Informatics:* AI technologies in health informatics include applications such as medical image analysis, predictive analytics for disease diagnosis, and personalized treatment recommendations.
- *Natural Language Processing (NLP):* NLP deals with the interaction between computers and human language. It encompasses tasks such as language translation, sentiment analysis, speech recognition, and language generation. NLP enables machines to comprehend, interpret, and generate human language, making it a key technology for applications such as virtual assistants, chatbots, and language translation services. Large Language Models (LLMs) are a version of NLP that uses a large amount of data for learning and generation of results.
- *Predictive Analytics:* Predictive analytics uses algorithms and statistical models to analyze historical data and make predictions about future trends. It is applied in areas such as finance, healthcare, and marketing.
- *Robotics:* Robotics combines hardware and AI software to create intelligent machines capable of performing tasks in the physical world. Applications include industrial automation and healthcare robotics.

Purpose

Ethical and responsible use of AI must be paramount in all university research and creative activities that seek to develop or enhance AI systems or implement the use of AI technologies. The appropriate use of AI requires a collaborative approach among UNL administrators, faculty, staff, students, and others. UNL is committed to conducting research and creative activities with AI that align with the guiding principles and best practices listed below to promote the university's research mission.

Scope

This document describes guiding principles and best practices for AI in research and creative activities at UNL. The Vice Chancellor for Research and Innovation will work with the college and IANR deans, center directors, and departmental executive officers (DEOs) to ensure that all UNL employees and students that develop or use AI in research and creative activities will follow these guidelines and best practices.

Guiding Principles

The following guiding principles are based on ethical standards and information from Executive Order 14110 of October 30, 2023, the Congressional Research Service, academic institutions, and the private sector. UNL employees and students who develop or use AI technologies in research and creative activities are expected to follow these guiding principles. UNL employees

and students are encouraged to participate in AI training programs to understand how AI is used in research and creative activities at UNL; the relevant privacy laws and regulations to protect the privacy of the data and the privacy of individuals and groups; (e.g., HIPAA, FERPA, EU GDPR, PIPL, and CCPA) and how to detect and correct biases, potential manipulation, or unintended behaviors of the AI system.

Accountability: Those who design and deploy AI systems must be accountable for how these systems operate. Owners of the AI technology, the processes they support, the results they produce, and the potential impact of those processes must be clearly identified. In case of unintended consequences, discrimination, or privacy breaches, procedures must be established for remediation, recourse, or redress. Monitoring and evaluation of AI performance, impact, and compliance with ethical standards must be conducted to help identify and address emerging issues or areas of improvement.

Fairness: When AI systems are used for research or creative activities with humans, fairness must be built into the development and use of AI through checks and balances that prevent unlawful discrimination against individuals or groups of individuals. Known biases present in the data used to train the AI system must be identified and mitigated. As knowledge of new biases emerge, these must also be addressed.

Inclusiveness: AI systems used for research or creative activities with humans must be equally accessible and comprehensible to all UNL employees and students regardless of disabilities, race, ethnicity, gender, orientation, experiences, or cultural differences. UNL employees and students are expected to understand the limits of databases and AI systems. Biases of the past must not be unintentionally built into future AI systems. Obtaining input from diverse stakeholders during the development and deployment of AI systems is encouraged and all documentation should be maintained to demonstrate the steps that were taken to avoid incorporation of biases. These processes will help build public trust.

Privacy: AI systems must respect and protect the privacy of individuals and groups by complying with applicable privacy laws and regulations (e.g., HIPAA, FERPA, EU GDPR, PIPL, and CCPA) and best practices when using personally identifiable information(PII) . UNL employees and students must also follow the University of Nebraska's Policy for Responsible Use of University Computers and Information Systems, Policy on Research Data and Security, and Policy on Risk Classification and Minimum Security Standards.

Reliability and Safety: Since data sources are constantly changing, and new and larger sources of data are added, outputs from AI systems must be continuously monitored and validated. AI systems must demonstrate that they are designed to operate within a clear set of parameters and that the technology is behaving as intended under actual operating conditions. Measures should be taken and documented that AI systems must be resistant to intended or unintended manipulation and must be sufficiently agile to address new situations. Reliable AI systems will help foster public trust in these technologies.

Security: Strong security systems must be implemented to prevent unauthorized access to AI systems and the data processed by these systems. Balance must be achieved between the value of the information and confidence in our ability to protect the data. UNL employees and students must follow the University of Nebraska's [Policy for Responsible Use of University Computers and Information Systems](), [Policy on Research Data and Security](), and [Policy on Risk Classification and Minimum Security Standards]().

Transparency: When developing or using AI technologies for research or creative activities, the known capabilities and limitations of these technologies should be clearly explained and communicated to the potential users, stakeholders, and the public. The use of AI should be documented and conveyed alongside creative works, performances, publications, and presentations. Potential biases or ethical concerns associated with AI technologies must be disclosed. Providing transparency in the algorithms and their decision-making processes will help enhance trust and accountability.

Best Practices
The following best practices are strongly encouraged in all research and creative activities at UNL:
1) Accuracy and integrity of outputs from AI tools used in research and creative activities are the responsibilities of UNL employees and students. AI-generated content often paraphrases information from other sources and may generate inaccurate information. ***UNL employees and students must accept responsibility and accountability for the content produced by AI technology.*** AI tools cannot be responsible or accountable for the content that is generated. To avoid concerns regarding bias, inaccuracy, plagiarism, and potential misappropriation of intellectual property in AI-generated content, UNL employees and students must:
    a) Validate results from decisions made by AI systems based on their research or other evidence.
    b) Actively seek and mitigate bias in the data used to train AI systems by using diverse datasets and techniques such as debiasing algorithms to address potential unfairness.
    c) Regularly audit AI outputs for bias and discriminatory outcomes by implementing monitoring systems and feedback loops to identify and correct biased results.
    d) Ensure inclusivity in research and creative design involving AI by engaging diverse stakeholders and incorporating user perspectives to avoid perpetuating or amplifying existing biases.
    e) Communicate the limitations and capabilities of AI tools clearly and honestly. Don't overstate the accuracy or intelligence of AI and be transparent about its potential for errors and misinterpretations.
2) Data placed into AI tools that are externally available become open source and available to the public. UNL employees and students are expected to follow federal guidelines for making data generated with federal funding available to the public; however, they should be cautious about placing preliminary data or sensitive information into open-

sourced AI tools prior to publication or prior to seeking and subsequent filing of patents. UNL employees and students are expected to:

   a) Implement robust data security measures to protect data with PII used in AI research and development. Utilize appropriate access controls, encryption, and anonymization techniques to minimize privacy risks.

   b) Be mindful of data ownership and consent when using data with PII for AI projects. Obtain informed consent from individuals and comply with relevant privacy regulations.

   c) Consider privacy implications when deploying AI systems in research or creative applications. Assess potential risks of data misuse or unintended surveillance and implement safeguards to protect individual privacy.

   d) Follow the University of Nebraska's Policy for Responsible Use of University Computers and Information Systems, Policy on Research Data and Security, and Policy on Risk Classification and Minimum Security Standards.

   e) Follow applicable privacy laws and regulations (e.g., HIPAA, FERPA, EU GDPR, PIPL, and CCPA) and best practices when using data that includes PII.

3) Before initiating future agreements with vendors, subcontractors, or collaborators inquiries should be made regarding any potential use of AI. Additional terms and conditions may be needed in current and future agreements to ensure the responsible and ethical use of AI that aligns with these guiding principles and best practices.

4) Federal funding agencies prohibit the use of AI tools during the peer-review process. The National Institutes of Health (NIH) prohibits *"scientific peer reviewers from using natural language processors, large language models, or other generative Artificial Intelligence (AI) technologies for analyzing and formulating peer review critiques for grant applications and R&D contract proposals."* Using AI in the peer review process is a breach of confidentiality because these tools *"have no guarantee of where data are being sent, saved, viewed or used in the future."* Using AI tools to help draft a critique or to assist with improving the grammar and syntax of a critique draft are both considered breaches of confidentiality. The National Science Foundation (NSF) has similar guidelines for the use of AI in proposals and the NSF merit review process. The USDA National Institute of Food and Agriculture (NIFA) Peer Review Process for Competitive Grant Applications also prohibits the use of generative AI tools during the proposal evaluation process.

5) Research personnel are accountable for any plagiarized, falsified, or fabricated material that was generated by AI, regardless of funding. The UNL Research Misconduct Policy and federal funding agencies specify the definitions and processes involved if material has been plagiarized, falsified, or fabricated.

6) Research personnel must keep up with evolving AI technologies and best practices for ethical and responsible use of AI in research and creative activities by regularly reviewing university policies and relevant guidelines from federal funding agencies.

7) Be mindful of the environmental impact of AI training and deployment. Choose energy-efficient algorithms and infrastructure and explore sustainable computing practices.

8) Guidelines for content co-authored with an AI tool:

a) The published content must be attributed to UNL and the UNL employee(s) and/or student(s).

b) The role of AI in generating and/or revising content must be clearly disclosed in a way that no reader could possibly miss and that a typical reader would find sufficiently easy to understand.

    i.   In general, the use of AI tools to edit the content of a few sentences does not usually require disclosure; however, the use of AI tools to improve the content of an entire manuscript requires disclosure, and the UNL employee(s) and/or student(s) must ensure that the AI-generated or - revised content is accurate and has not been plagiarized.

    ii.   Use of AI tools to insert or impart knowledge or creative activities must be disclosed.

c) Topics of the content do not violate the AI tool company's content policy or terms of use (e.g., are not related to adult content, spam, hateful content, content that incites violence, or other uses that may cause social harm).

d) The following language may be used for this purpose: *"The author(s) generated this text in part with [insert name of AI tool and company or reference for AI tool], a large-scale language-generation model. Upon generating draft language, the author(s) reviewed, edited, and revised the language to their own liking and the author(s) take(s) ultimate responsibility for the content of this publication."*

e) Additional information is available from the American Chemical Society "Best Practices for Using AI When Writing Scientific Manuscripts" (*ACS Nano 2023, 17, 4091–4093; https://doi.org/10.1021/acsnano.3c01544*).