



Artificial Intelligence: Opportunities and Challenges

UC Davis | Tuesday, July 18, 2023

Moderator



Nancy Gonzales

Executive Vice President and University
Provost
Arizona State University

Speakers



Thulasi Kumar

Associate Vice Provost , Analytics &
Institutional Effectiveness
Virginia Tech



Abram Anders

Interim Associate Director of the Student
Innovation Center and Associate
Professor of English
Iowa State University



ARTIFICIAL INTELLIGENCE: CHALLENGES AND OPPORTUNITIES

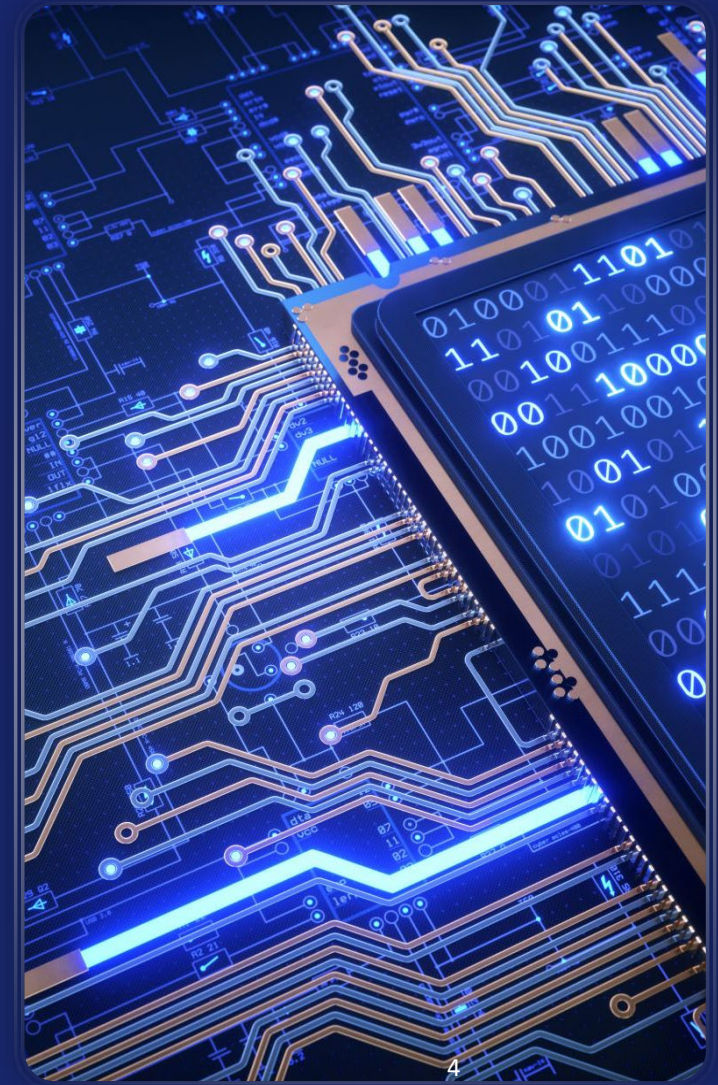
THULASI KUMAR
ASSOCIATE VICE PROVOST
ANALYTICS & INSTITUTIONAL EFFECTIVENESS, VIRGINIA TECH

WHAT IS ARTIFICIAL INTELLIGENCE (AI)?

- A computerized system that exhibits behavior that is commonly thought of as requiring intelligence. (Preparing for the Future of Artificial Intelligence, National Science and Technology Council, 2016)
- A field that studies intelligent behavior in humans using the tools-theoretical and experimental-of computer science. The field simultaneously addresses one of the most profound scientific problems-the nature of intelligence-and engages in pragmatically useful undertakings: developing intelligent systems. (Association for the Advancement of Artificial Intelligence (AAAI), 1994)

The founding father of AI, Alan Turing, defines this discipline as:

- “AI is the science and engineering of making intelligent machines, especially intelligent computer programs.” (The thinking computer. San Francisco, CA: W.H. Freeman, 1976)



VARIOUS TECHNIQUES OF AI



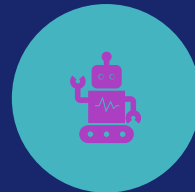
NATURAL
LANGUAGE
PROCESSING
(NLP)



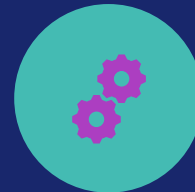
SPEECH
RECOGNITION



VISION
(MACHINE)



ROBOTICS



MACHINE
LEARNING



EXPERT
SYSTEMS

AI APPLICATIONS IN HIGHER EDUCATION ADMINISTRATION



Assessment

Summaries for academic program review and accreditation, ideas for new learning outcomes, developing new strategic program goals, etc.



Institutional Research

Survey research, text categorization, sentiment analysis, identifying emerging campus issues, resource allocation, etc.



Enrollment Management

Enrollment optimization, review transcripts, transfer recommendations, student success through personalization of services, website and academic recommendations, prospects communication, etc.



Faculty Affairs and Research Administration

Research expertise using Knowledge Graphs, generating new research ideas, cost reduction in R&D, etc.



Data Analytics

Develop or optimize code, data summarization, perform predictive analytics, etc.



Data Management/Data Governance

Data security and privacy



Human Resources

Review of job applications, transcripts, and prospective candidate recommendations

SELECTED AI TECHNIQUES FOR ADMINISTRATION

Assessment
(NLP)

Institutional Research
(NLP, Speech Recognition,
and ML)

**Enrollment
Management**
(NLP, ML, and Expert
Systems)

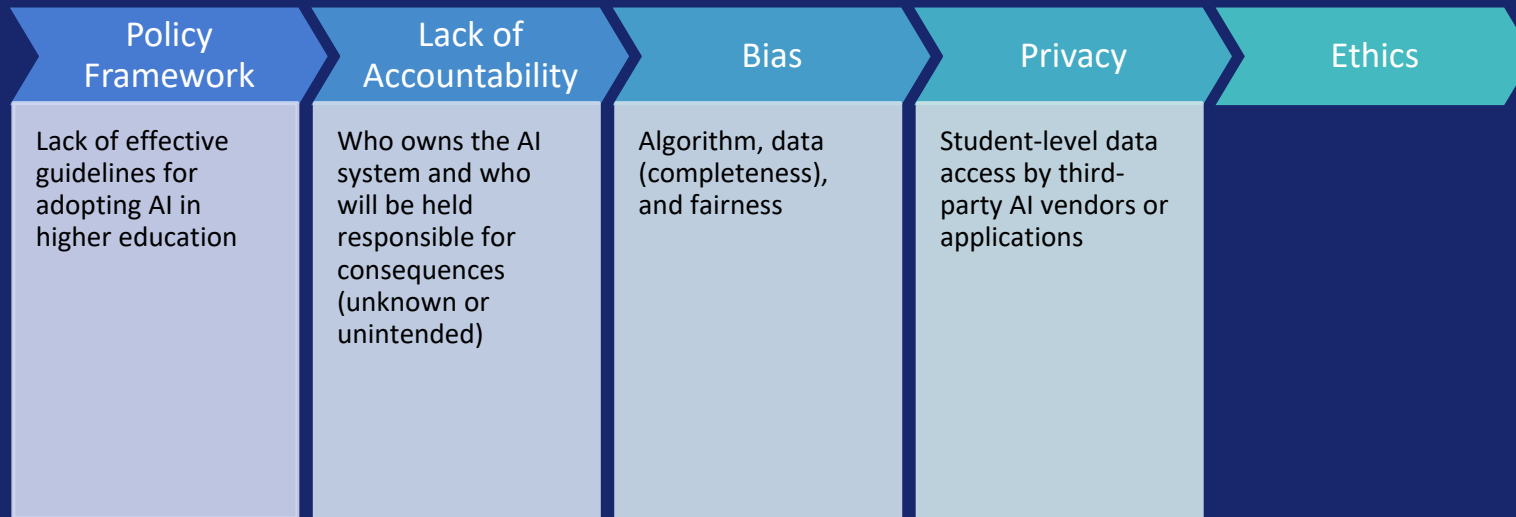
**Faculty Affairs and
Research Administration**
(ML/Knowledge Graphs
and NLP)

Data Analytics
(ML and Deep Learning)

**Data Management/Data
Governance**
(ML/Streaming Data
Governance and NLP)

Human Resources
(NLP and ML)

CHALLENGES



OPPORTUNITIES

More efficient and effective due to broader and more detailed access to data in a timely manner

Bridge gaps in equity and inclusiveness

New institutional AI governance structure, emphasizing principles and practice

More contemporary tools, techniques, and methodologies to address bias, transparency, and explainability

Access to several new resources, previously unknown or difficult to access

Opportunities to form new thought leadership groups

Create local AI infrastructure to address access to sensitive data

Artificial Intelligence Challenges and Opportunities

Association of Public and Land-Grant Universities
Council on Academic Affairs
Commission on Information, Measurement, and Analysis

Abram Anders

Interim Associate Director of the Student Innovation Center
Associate Professor of English
Iowa State University
<https://abramanders.com/>

Generative AI

Generative AI offers diverse applications which will **transform learning** and higher education institutions.

The Generative AI Application Landscape



APPLICATION LAYER	Marketing (content)						
	Sales (email)	Code generation	Image generation				Gaming
	Support (chat / email)	Code documentation	Consumer / Social				RPA
	General writing	Text to SQL	Media / Advertising				Music
	Note taking	Web app builders	Design	Voice Synthesis	Video editing / generation	3D models / scenes	Audio
	Other						Biology & chemistry
	TEXT	CODE	IMAGE	SPEECH	VIDEO	3D	OTHER
MODEL LAYER	OpenAI GPT-3	OpenAI GPT-3	OpenAI Dall-E 2	OpenAI	Microsoft X-CLIP	DreamFusion	TBD
	DeepMind Gopher	Tabnine	Stable Diffusion		Meta Make-A-Video	NVIDIA GET3D	
	Facebook OPT	Stability.ai	Craiyon			MDM	
	Hugging Face Bloom						
	Cohere						
	Anthropic						
	AI2						
	Alibaba, Yandex, etc.						

Challenges

“Our sense is that **generative AI feels deeply threatening to many faculty** because it seems to co-opt the forms of assessment that are integral to their teaching ... And that can feel like having to start from scratch as a professional.”

Opportunities

AI Required: Teaching in a New World with Ethan Mollick | ASU+GSV 2023

Before AI


Come up with a theoretical product design

Create and test a prototype.
Write an outline.

After AI

Come up with a product design

Build the product using laser cutters and 3D printers, build a working app, create marketing material, create custom graphics, do design work, produce multiple reports...

A group of students are gathered around a table, showcasing their projects. On the table, there are various items including a colorful geometric board game, a laptop, a smartphone, and some printed materials. The students are smiling and appear to be proud of their work. In the background, other people can be seen, suggesting a busy event or workshop environment. The table has a sign that reads "ASU + GSV SUMMIT".

Large Language Models (LLMs)

LLMs have **highly fluent** text generation capabilities with growing features and applications, but can **struggle** with tasks requiring **common sense reasoning** and/or an understanding of the world.



ChatGPT



Bing

ANTHROPIC



Bard

Leading LLM Technologies

MODEL	RUNS CODE	SEE IMAGES	READS FILES	INTERNET CONNECTION	PERSONALITY	WHAT IS IT	WHEN TO USE IT
ChatGPT/ GPT-3.5				No	Neutral, bland	This is the free version of ChatGPT that came out in November. It is very fast and pretty solid at writing and coding tasks.	It is fast and cheap and capable, but other models are now better. Also, It is not connected to the internet, so don't use it like a search engine.
ChatGPT/ GPT-4		Soon		No	Helpful, a little preachy	Currently available to paying customers. The most powerful LLM for most purposes. Does a lot.	Better at everything (writing, coding, summarizing) than GPT-3.5 Still not connected to the internet.
ChatGPT/ Code Interpreter/ Plugins	Yes		Yes	Limited	Helpful sometimes witty	Adds new capabilities to ChatGPT. Plugins and web browsing still have rough edges. Code Interpreter lets the AI run Python code & work with files.	Code Interpreter is great for working with data of all sorts, and is the most generally impressive AI implementation so far. Plugins are generally not that useful, yet. The web browsing is being updated.
Bing (Uses GPT-4 in creative & precise modes)		Yes	Yes	Yes	Friendly but also somewhat insane	Connected to the internet. It is GPT-4 with a grab-bag of powerful features. The weirdest model. Creative mode lets you use GPT-4 and is free.	Does a remarkably wide range of stuff, from working as a browser companion to creating art. Is connected to the internet. Has a strong, weird personality.
Bard	Yes	Yes		Yes	None	Bard is a name for a variety of models used by Google. Current offerings are weak, but improving over time	This should be your last choice of AIs for now, but recent updates show promise. High levels of hallucination.
Claude 2			Yes	No	Pleasant when not scolding	Almost as powerful as GPT-4, but built to be "safer" and more pleasant to use. Has 100k context window - enough "memory" to hold a book.	Terrific on working with large documents, due to its extended context window and ability to upload content. it is very new so it is unclear how it stacks up.

as of Summer 2023, [oneusefulthing.org](https://www.oneusefulthing.org)

<https://www.oneusefulthing.org/p/what-ai-can-do-with-a-toolbox-getting>

ChatGPT: Code Interpreter



I am interested in doing some predictive modelling, where we can predict what powers a hero might have based on other factors. how should we approach this?



Predictive modeling for this case can be a bit complex due to the nature of the data. Here are a few things to consider:

1. **Multi-label Classification:** Each superhero can have multiple powers, so this is a multi-label classification problem. In other words, each superhero can belong to more than one class (power).
2. **Feature Selection:** We need to decide which features (columns) we want to use as predictors. The superhero's personal characteristics like `'Gender'`, `'Eye color'`, `'Race'`, `'Hair color'`, `'Height'`, `'Publisher'`, `'Skin color'`, `'Alignment'`, and `'Weight'` could potentially be used as features. Remember that categorical features will need to be converted into a format that can be used in the model (e.g., one-hot encoding).
3. **Data Preprocessing:** The dataset needs further preprocessing. For instance, we have missing values represented as `'np.nan'` that we'll need to handle, and we may need to normalize numerical features like `'Height'` and `'Weight'`.
4. **Model Selection:** There are many machine learning algorithms that can handle multi-label classification, such as Decision Trees, Random Forests, K-Nearest Neighbors (KNN), and more sophisticated methods like neural networks. We would need to choose a suitable model.
5. **Evaluation Metrics:** We need to decide on how we will evaluate the performance of our model. Common metrics for multi-label classification include Hamming Loss, Zero-One Loss, and the Jaccard Score.

Given these considerations, a potential first step could be to preprocess the data and prepare it for use in a machine learning model. Does this approach sound good to you?



pick which you think is best, be clear about strengths and weaknesses



Based on the nature of our data, a Random Forest classifier would be a good starting point for our predictive model.

Random Forests are an ensemble learning method that operates by constructing multiple decision trees at training time and outputting the class that is the mode of the classes of the individual trees. It's a powerful algorithm that can handle both categorical and numerical features, and it's less likely to overfit than a single decision tree.

Strengths of using a Random Forest:

1. **Versatility:** Random Forests can be used for both regression and classification tasks.
2. **Handling Overfitting:** By constructing multiple decision trees and averaging the results, Random Forests help to avoid overfitting, a common problem with single decision trees.
3. **Handling Missing Values:** The algorithm can handle missing values by splitting the data so that similar data points are in the same subset.
4. **Automatic Feature Selection:** Random Forests provide an importance score for each feature, allowing us to understand which features are most predictive.

Weaknesses of using a Random Forest:

1. **Prediction Time:** Prediction time can be slow with a large number of trees.
2. **Complexity:** The model can be difficult to interpret compared to a decision tree, as it involves multiple trees.
3. **Parameters:** There are several parameters that need to be tuned to optimize the model, such as the number of trees, the number of features to consider at each split, etc.

To reduce the complexity of our model, we can focus on the top 10 most common powers.

MICROSOFT / TECH / ARTIFICIAL INTELLIGENCE

Microsoft announces Copilot: the AI-powered future of Office documents



/ Copilot is a modern AI assistant that will help Microsoft 365 users create Office documents.

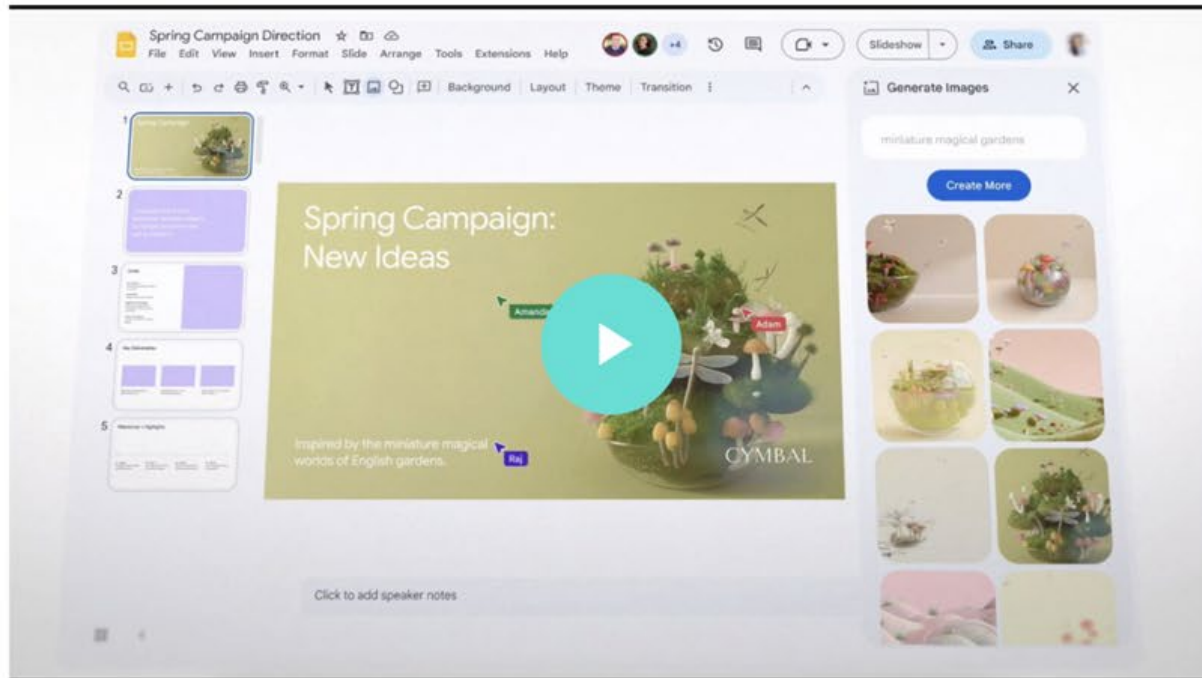
By [Tom Warren](#), a senior editor covering Microsoft, PC gaming, console, and tech. He founded WinRumors, a site dedicated to Microsoft news, before joining The Verge in 2012.

Mar 16, 2023, 8:06 AM PDT | [89 Comments](#) / [89 New](#)



<https://www.theverge.com/2023/3/16/23642833/microsoft-365-ai-copilot-word-outlook-teams>

Google announces AI features in Gmail, Docs, and more to rival Microsoft



/ Google will soon offer ways to generate text and images using machine learning in its Workspace products as part of a scramble to catch up with rivals in the new AI race.

By [James Vincent](#), a senior reporter who has covered AI, robotics, and more for eight years at The Verge.

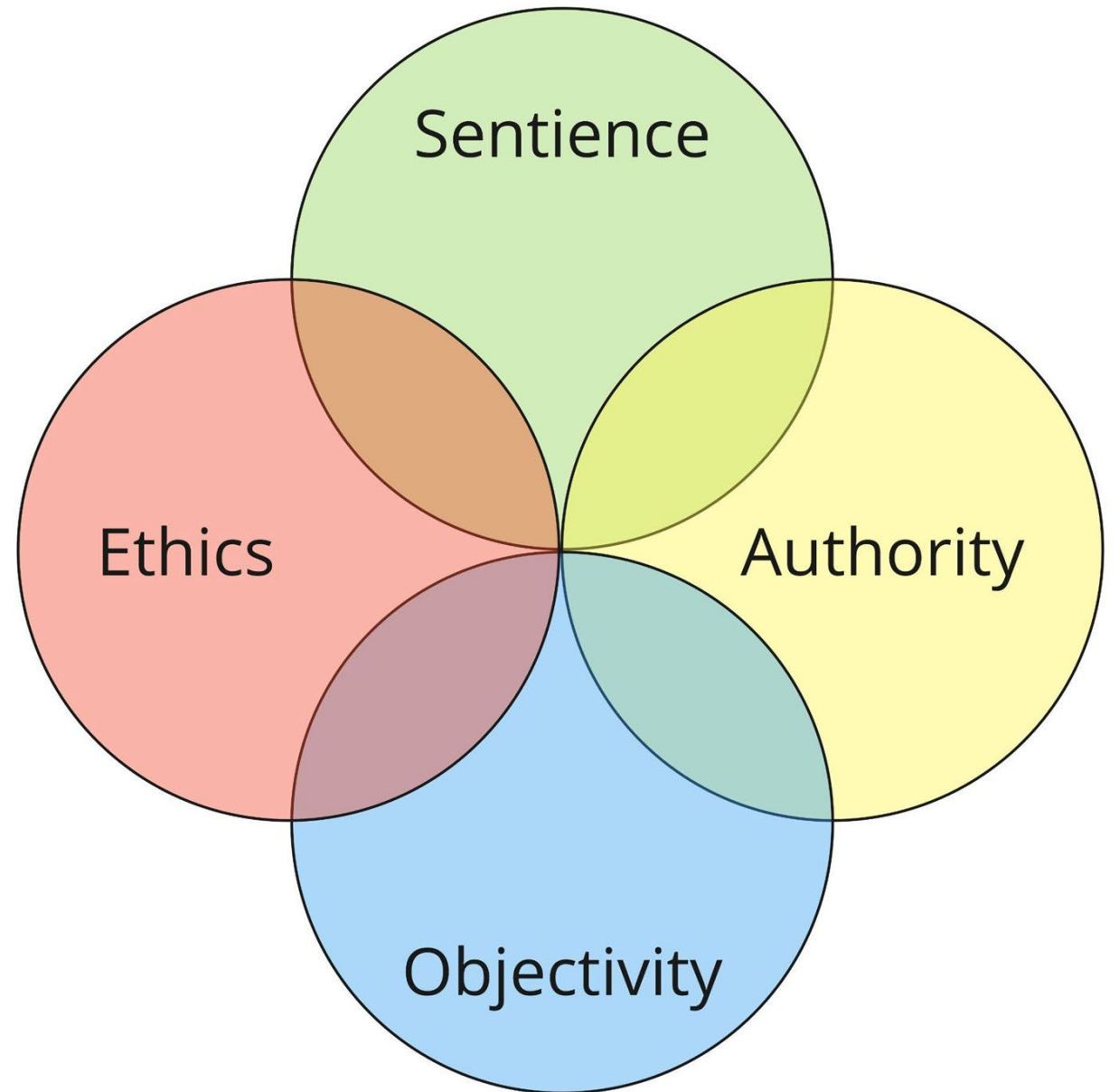
Updated Mar 30, 2023, 1:15 PM PDT | [54 Comments](#) / [54 New](#)



LLMs will **transform but not replace**
human intelligence in learning, teaching,
and professional work processes.

Limitations

Despite their magical emergent behaviors, LLMs **cannot replace human intelligence**. LLMs lack sentience, authority, objectivity, and ethics.



Risks

These limitations translates into a number of risks including:

- Privacy and intellectual property
- Misinformation and bias
- Authorial and academic integrity

Technological Disruption

300 million jobs

Lost or transformed by generative AI

Generative AI is Different

Compared to previous technological disruptions, generative AI is:

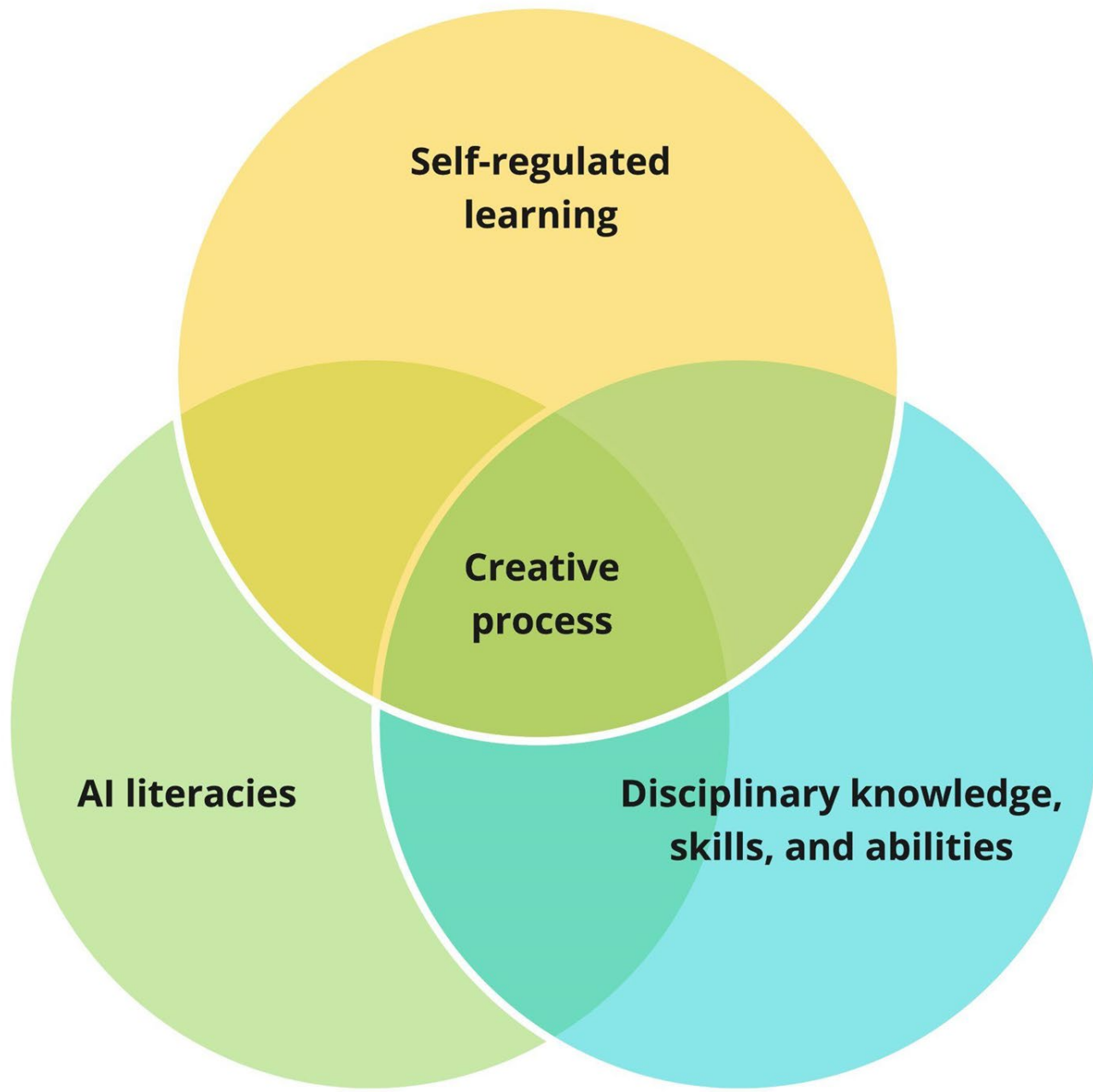
- Already advanced enough to disrupt everything
- Unlike software, it is not (yet) easy to scale or fully automate

Human in the Loop



Transformative Innovation

Students need **AI literacies**, but also practice with **situated disciplinary applications** and capacities for **self-regulated learning**.



ENGL 222X

Artificial Intelligence and Writing

Are you ready to unleash your creativity and explore the possibilities of *Artificial Intelligence and Writing* in Fall 2023?

- Understand and use AI tools such as ChatGPT and Bing AI
- Analyze and navigate ethical challenges of AI use
- Develop effective AI prompts and find accurate information
- Compose texts that seamlessly integrate AI-generated and processed content
- *Start something* amazing as a final creative project!

Learn more: <https://bit.ly/AI222X>



Transformative innovation requires shifting our understanding of the roles of **students**, **instructors**, and **generative AI**.

Students Act as Humans in the Loop

“Our guidelines **challenge students to remain the ‘human in the loop’** and maintain that not only are students responsible for their own work but they should actively **oversee the AIs output, check with reliable sources, and complement any AI output** with their unique perspectives and insights.”

Instructors Enable Evaluative Judgement

“**Evaluative judgement** is a learner's ‘capability to make decisions about the quality of work of self and others’ ... promoting evaluative judgement can prepare learners to work in an AI-mediated world as **‘it shifts the focus from being successful (yes or no), to coming to understand how success is constituted.’**”

AI as Adaptive Support for Social Learning

“A systems view of cognition distributed among humans and AI systems opens possibilities of new internet tools to enhance conversation, and of the web as a medium for social learning among humans and AI ... **What roles could GAI perform in this social learning process** of setting shared goals, performing tasks together, and conversing to reach agreements?”

Sharples, Mike. “Towards Social Generative AI for Education: Theory, Practices and Ethics.” arXiv, June 14, 2023.

<http://arxiv.org/abs/2306.10063>.

Emerging Pedagogical Applications

TABLE 1 SUMMARY OF SEVEN APPROACHES

AI USE	ROLE	PEDAGOGICAL BENEFIT	PEDAGOGICAL RISK
MENTOR	Providing feedback	Frequent feedback improves learning outcomes, even if all advice is not taken.	Not critically examining feedback, which may contain errors.
TUTOR	Direct instruction	Personalized direct instruction is very effective.	Uneven knowledge base of AI. Serious confabulation risks.
COACH	Prompt metacognition	Opportunities for reflection and regulation, which improve learning outcomes.	Tone or style of coaching may not match student. Risks of incorrect advice.
TEAMMATE	Increase team performance	Provide alternate viewpoints, help learning teams function better.	Confabulation and errors. “Personality” conflicts with other team members.
STUDENT	Receive explanations	Teaching others is a powerful learning technique.	Confabulation and argumentation may derail the benefits of teaching.
SIMULATOR	Deliberate practice	Practicing and applying knowledge aids transfer.	Inappropriate fidelity.
TOOL	Accomplish tasks	Helps students accomplish more within the same time frame.	Outsourcing thinking, rather than work.

Role	Description	Example
Possibility Engine	AI generates alternative ways of expressing an idea.	Students write prompts in ChatGPT and submit each prompt multiple times to examine alternative responses.
Socratic Opponent	AI acts as a respondent to develop an argument.	Students enter prompts into ChatGPT to converse or debate. Teachers can ask students to use ChatGPT to prepare for discussions.
Collaboration Coach	AI helps groups to research and solve problems together.	Working in groups, students use ChatGPT to discover information to complete assignments.
Co-Designer	AI assists throughout the design process.	Students ask ChatGPT for ideas about designing or updating a website, or focus on specific goals (e.g., how to make the website more accessible).
Exploratorium	AI provides tools to play with, explore and interpret data.	Students use ChatGPT to explore different ways to visualise and explain a large database, such as census data.
Storyteller	AI creates stories that include diverse views, abilities and experiences.	Students take it in turn to ask ChatGPT to continue a story, prompting it to include a diversity of characters.

Table 1: Some roles for generative AI in cooperative and social learning

Sharples, M. (2023). Towards social generative AI for education: Theory, practices and ethics (arXiv:2306.10063). arXiv. <http://arxiv.org/abs/2306.10063>

Mapping AI uses with Bloom's Taxonomy

Self-regulation & metacognition

- **Coach** prompting for reflection and self-assessment

Analyze, evaluate, create

- **Exploratorium** supporting ideation and interpretation
- **Mentor** providing feedback
- **Teammate** facilitating collaboration
- **Tool** accomplishing tasks

Understand, remember, apply

- **Tutor** providing direct instruction
- **Student** receiving explanations
- **Simulator** to engage in deliberate practice with specific applications

At a systems level, **human in the loop** approaches are also essential to **ethical applications** of generative AI.

Ethical AI Innovation



Challenges and Opportunities

“The silence about AI on campus is shocking. Nationwide, college administrators don’t seem to fathom just how existential AI is to higher education.”

Faculty Survey

- “Almost **70 percent** said they planned to **change their assignments** to make it harder to **cheat** using AI.
- Nearly **half** said they planned to **incorporate the use of AI** into some assignments to help students understand its strengths and weaknesses.”

Students will need help developing situated **AI literacies** and adapting to **flexible policies for academic use** across disciplines and courses.

Flexible Policies for Academic Use

- When content-generating AI is not allowed
- When content-generating AI is allowed with appropriate attribution
- When content-generating AI use is allowed in limited instances
- When content-generating AI use is encouraged broadly

Challenge: Student Confusion

“He initiated a class discussion, which was beneficial: ‘It became clear that **the line between which AI is acceptable and which is not is very blurry**, because AI is being integrated into so many apps and programs we use. ... I didn’t have answers for all of their questions and concerns but it helped to clear the air.’”

Supporting Students

Dysfunctional Mindset: We need top-down policies, AI detection, and enforcement of academic integrity.

Reframe: Faculty need to help students understand **responsible use** in their courses and develop **evaluative judgement** that supports disciplinary learning goals.

Faculty need help **transforming learning and assessment practices** to focus on authentic learning using established approaches such as **active learning, experiential learning, team-based learning, and project-based learning.**

Active Learning Strategies

Table of Contents
<ul style="list-style-type: none">• Active-Learning• Inductive-Learning• Backward Design• Experiential Activities• Haptic Engagement• Retrieval Practice• Metacognition & Problem-Solving Strategies• Just-in-Time Teaching• Guided Discovery• Coached Ideation• Visualizing Systems Thinking• Case-Study Method• Shared Solutions / Send-A-Problem• Learning Artifacts & Portfolios• Cooperative & Team-Based Learning• Role-Playing & Evaluation



Opportunity: Pedagogical Innovation

“The path I recommend is ... using a social contracts approach that brings all stakeholders together to **collaboratively experiment and transparently develop organizational policies and norms** ... we have launched a summer laboratory initiative on generative AI. Each week, a group of professors will explore a new way to use AI in their work.”

Supporting Faculty

Dysfunctional Mindset: We need to protect the integrity of traditional assessments or cheating will become rampant.

Reframe: We need to adopt more effective methods like **active learning and experiential learning** which use authentic learning and assessment tasks and embrace **AI as an adaptive learning assistant**.

Academic leaders need to transform their **programs and curricula** to focus on student capacities for **self-regulation, collaboration, and leadership.**

Challenge: The Future of Work

“We argue that LLMs are transforming the responsibilities of data scientists, shifting their focus from hands-on coding, data-wrangling and conducting standard analyses to assessing and managing analyses performed by these automated AIs. This **evolution of roles** is reminiscent of the transition **from a software engineer to a product manager**, where strategic planning, coordinating resources, and overseeing the overall product life cycle supersede the task of writing code.”

Transforming Curricula

Dysfunctional Mindset: Some disciplines will go away while others grow.

Reframe: All disciplines will be transformed as **higher-order skills**—critical thinking, communication, collaboration, creative problem solving, and leadership—**become more important than ever.**

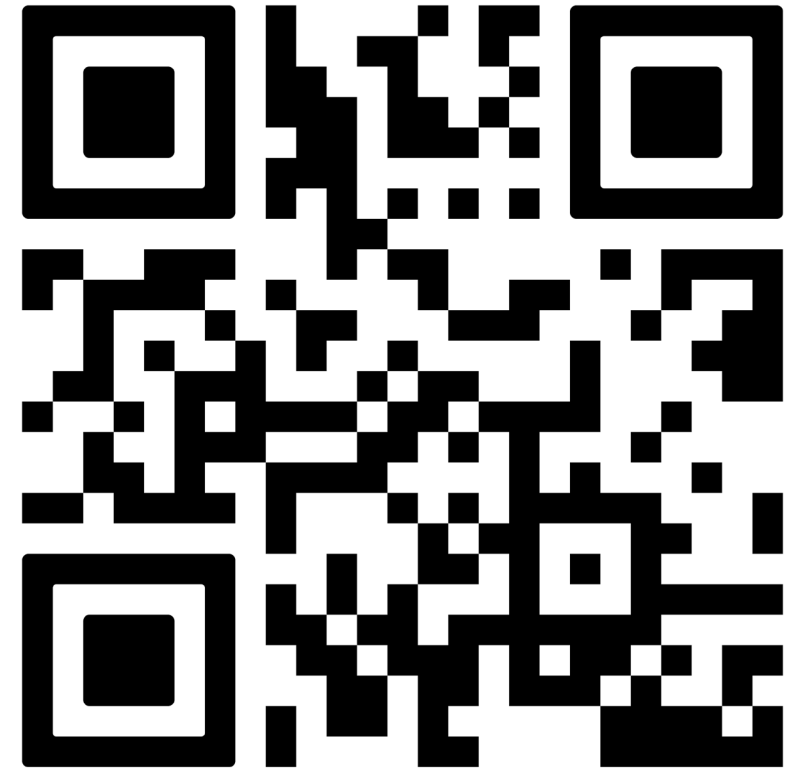
How might we?

How might we?

- Proactively mitigate student confusion and academic integrity issues?
- Promote pedagogical innovation that uses AI to enable student-centered, high-order learning?
- Prepare for futures as managers and leaders of generative AI supported teams?

Small Group Discussion

- How are you using AI technologies at your institution?
- What challenges, concerns, questions do you have regarding AI technologies?
- What topics/areas in AI would you like to be included as part of the APLU Annual Meeting in November?



<https://bit.ly/3NVEyKI>