9th Annual International Conference on Mechanical Engineering, June 21-23, 2025

The Athens Institute

Artificial Intelligence in Engineering Education and Research

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Current status

Growing awareness of how AI technology is reshaping education and innovation

to further our academic and professional excellence for all programs and stakeholders

Artificial Intelligence's perspective

Q: What is the contribution of AI in engineering teaching and research - in one statement

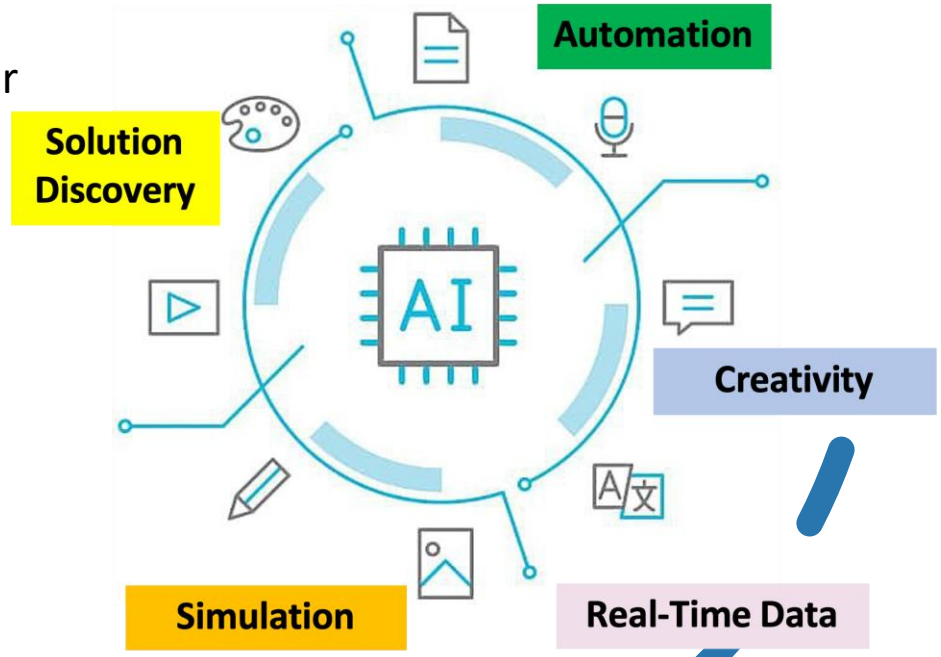
A: (open AI) "AI enhances engineering teaching and research by enabling

- *personalized learning*
- *automating routine tasks*
- *accelerating innovation*

through intelligent data analysis, simulation, and design optimization."

AI in Research Innovation

- **Automates** design, optimization, data analysis, creation of new content, and time-consuming repetitive tasks
- Ensures **data accessibility**, timeliness, and readiness for use whenever needed for analysis, decision-making, or operations through AI
- Enables novel **solution discovery** through knowledge integration
- "Improves" the accuracy and efficiency of **simulations**
- Integrates **real-time data** from various sources (e.g., IoT devices and sensors)
- Enhances **creativity, efficiency, and sustainability**, allowing for technology innovation



Parts of this slide are adopted from 8th Annual Northeast ME DH/Chairs Summit Presentation of Katsuo Kurabayashi (NYU) and Christopher J. Hansen (Umass Lowell)

AI in Engineering Education (instructors)

Automation

Curriculum updates, problem and content generation, automated grading, report templates, summations, coding and CAD assignments, code debugging, graph summation, new content (images, audio, text, video.

Personalization

Develop adaptive content, provide individual feedback, detect plagiarism and ethical breach, personalized teaching assistance.

Intelligence

AI-driven insights, up-to-date knowledge integration, academic advising, decision support, learning analytics, real time classroom insights.

1. https://www.datamation.com/applications/what-is-automation
2. https://www.progress.com/blogs/segmentation-vs-personalization
3. https://www.ece.fr/en/why-should-you-follow-a-course-in-artificial-intelligence

Johri et al., JEE (2023)
Yelamarthi et al. JEET (2024)

AI in Engineering Education (students)

Technical Skill Development

3D modeling, rapid prototyping, design optimization, simulation analysis, coding in Python/C++/MATLAB, algorithm development, generative design.

Learning Support & Personalization

Adaptive learning, personalized feedback, study planning, summarization, flashcard generation, accessibility support, language translation.

Communication & Academic Productivity

Technical writing, presentation design, grammar refinement, language clarity, AI-assisted editing, course planning, career exploration.

1. https://www.freepik.com/premium-vector/technical-skills-clip-art-icon-professional-development-expertise_375835218.htm
2. https://claned.com/the-role-of-ai-in-personalized-learning
3. https://rcademy.com/communication-skills-for-effective-teamwork-and-collaboration

an Example

Javaid et al., BenchCouncil Transactions on Benchmarks, Standards and Evaluations,(2023) https://doi.org/10.1016/j.tbench.2023.100115.

AI in Engineering Education

University AI Degrees

~150–200 undergrad programs; 250+ graduate programs (U.S.)

Global AI-specific Programs

Hundreds of formal AI curricula internationally (e.g. , ~744 in the UK)

Online Certifications & MOOCs*

500+ platforms offering AI credentials; individual courses with million+ learners

Corporate/Edu Partnerships

Corporate programs reaching millions globally (e.g., IBM, Huawei)

**MOOC: Massive Open Online Course*

Discussion Points

8th Annual Northeast ME DH/Chairs Summit

How will GenAI reshape the overall landscape of ME engineering education?

How should we incorporate GenAI into ME courses to prepare our students to collaborate effectively with AI tools?

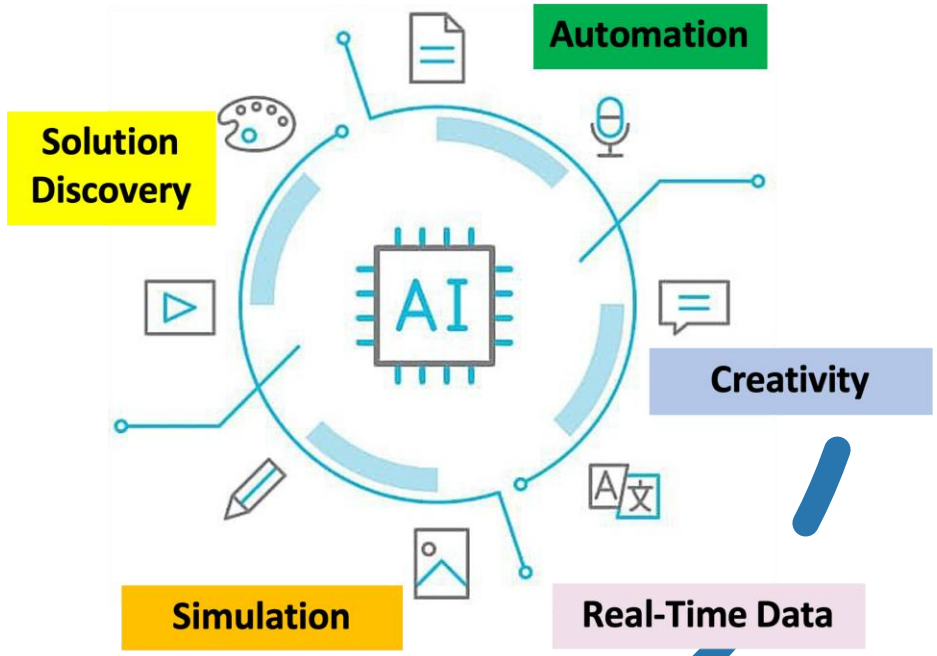
How should students be taught to handle ethical challenges posed by GenAI?

What steps can we take to prepare our faculty to use AI tools in their teaching?

Questions adopted from 8th Annual Northeast ME DH/Chairs Summit Presentation

How will GenAI reshape the overall landscape of ME engineering education?

- Redefining Educational Priorities
- Reinventing Assessment Methods
- Teaching How to Think, Not Just What to Do
- AI as a Cognitive Partner, Not a Replacement.
- Empowering Lifelong Learning



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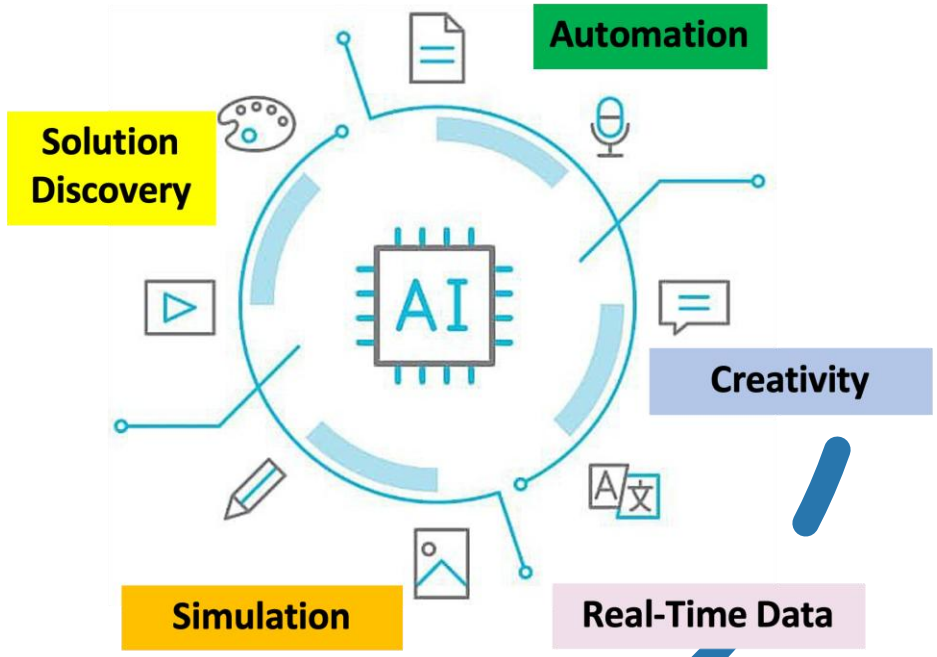
How should we incorporate GenAI into ME courses to prepare effective student collaboration with AI tools?

- Introduce Comparative Assignments
- Include a Foundational AI Module
- Blend AI into Core Engineering Subjects
- Position AI as a Creative Engineering Tool
- Emphasize Human Oversight and Collaboration



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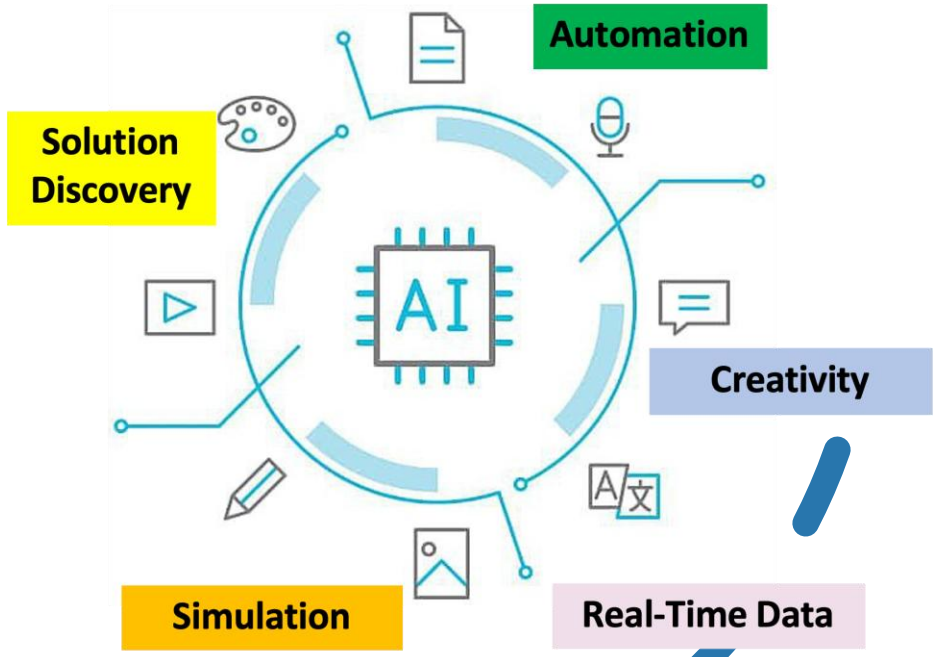
How should students be taught to handle ethical challenges posed by GenAI?

- Integrate Ethics into the Engineering Curriculum
- Encourage Responsible Use and Attribution
- Explore Legal and Social Implications
- Develop Critical Thinking Around AI Outputs
- Promote Ethical Decision-Making Frameworks
- Set Clear Academic Policies



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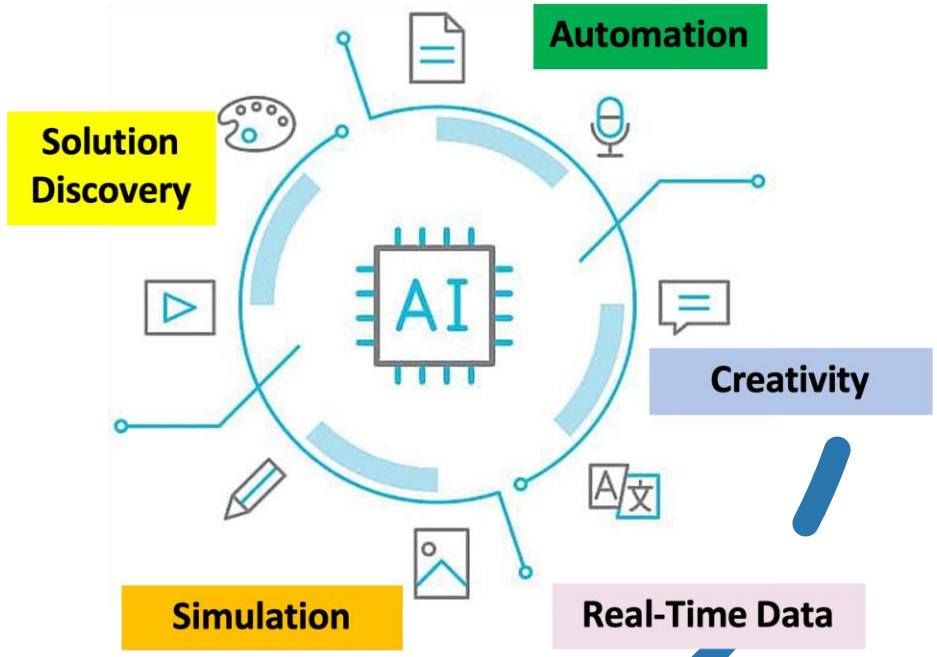
What steps can we take to prepare our faculty to use AI tools in their teaching?

- Provide Hands-On Training and Support
- Foster a Collaborative Faculty Learning Environment
- Encourage Exploration and Experimentation
- Enable Broad Access Through Licensing
- Recognize the Moment of Change



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Some Challenges

Cognitive Development and Learning Depth

Heavy reliance on AI tools can weaken students' essential thinking and understanding.

- Reduced critical thinking and problem-solving skills
- Loss of foundational knowledge when AI does most work

Ethics and Academic Integrity

AI use can blur academic boundaries and lead to unethical practices if misused

- Increased plagiarism and academic dishonesty
- Unclear authorship and originality of AI-generated content

Skill Development and Evaluation

Students may struggle to critically assess AI outputs without adequate subject knowledge

- Inability to verify or evaluate AI-generated results
- Overdependence reduces analytical and practical skills

Intellectual Property and Ownership

Legal and ethical questions arise when AI contributes significantly to original work

- Ambiguity over who owns AI-generated innovations
- Potential disputes about authorship and rights

Ideas and Actions Moving Forward

Nationwide and Global Benchmarking

encourage AI-focused surveys led by ME departments and academic associations

Curriculum Redesign Based on Evidence

use insights from these surveys to inform curriculum changes that preserve engineering rigor while integrating AI

Balance and Boundaries

develop clear strategies to balance AI use with hands-on learning to ensure students still engage deeply with engineering concepts

Credits

FACULTY & INDUSTRY PARTNERS

CHATGPT

8TH ANNUAL NORTHEAST ME DH/CHAIRS SUMMIT

we are a team