



How AI Works: A Mini-Course for Penn Faculty

Details

Date & location

June 2-3, 9:30-3:00

Academic Research Building room 140

Instructor

Bhuvnesh Jain, Physics & Astronomy

Lab leaders

Rachel Hoke, CETLI

Jajwalya Karajgikar, Penn Libraries

Guest lecturers

Chris Callison-Burch, Computer and Information Science

Laura Zarrow, Wharton Generative AI Labs

Registration

[Register in Workday](#) (PennKey login required)

Description

Artificial intelligence is reshaping how we teach, research, and make decisions. This mini-course, designed for faculty across disciplines, offers an introduction to how AI works, what it can and cannot do, and where it might be headed.

You don't need to know how a calculator or word processor works to use it. AI is different: its strengths and its failure modes are less intuitive, and they show up directly in teaching, assessment, and scholarship. This course focuses on the principles and practices behind modern AI, so you can evaluate claims, anticipate errors and bias, and make informed choices about when and how to use AI in your work.

You will gain an understanding of how modern AI systems, especially generative AI, learn from data and produce language, images, and even novel ideas. The key concepts of word embeddings, neural nets, and training AI models will be introduced with intuitive examples and minimal math. Through hands-on exercises with accessible AI tools, you will explore the capabilities and pitfalls of generative AI. Lab sections will be offered, where you will engage more deeply in hands-on exploration and build an AI tool to support a teaching- or research-related use case. The course will also connect with current debates on the future of AI in scholarship and education and will address broader societal, policy, and environmental considerations.

The course is 8 hours long and consists of six self-contained modules and a lab session. Each module will typically consist of a 30-minute lecture, a 15-minute Q&A, and a 15-minute group exercise. The 90-minute lab session will have teaching and research options.

To supplement the lectures and exercises, optional readings, podcasts, and videos will be provided for each module. The primary sources are:

- *Artificial Intelligence: A Guide for Thinking Humans* by Melanie Mitchell
- [The 2026 Guide to Machine Learning](#) | IBM

Course Modules

Module 1: What makes a machine “intelligent”?

- A brief history: expert systems → supervised learning → deep learning → generative AI
- AI as a tool vs. AI as an epistemic agent
- Today’s “AI stack”: data, models, compute, and deployment
- Examples from scholarship: summarization, idea generation, classification, coding, translation

Module 2: Data-driven models of the world

- Data in AI: text, images, voice, video
- Finding a model for data: classical vs. data-driven approaches
- How models are evaluated, how they generalize, and often fail

Module 3: Neural networks and word embeddings

- The biological inspiration of neural networks
- The neural network architecture and how it is trained with data
- Word embeddings: how to represent text for a computer

Module 4: Large language models

- Natural Language Processing and LLMs
- LLMs in action: how text generation actually works
- Scaling laws: how AI gets better with more data

Module 5: The limitations and promise of generative AI

- The limitations of data-driven AI: hallucination and bias in LLMs
- Using generative AI to bring your ideas to reality
- Process and product: Designing for AI

Module 6: How AI gets better and where it is headed

- Improving and aligning AI: RLHF, RAG, and other acronyms
- What next? Agentic AI and more
- A brief guide to current AI models

Lab Sessions

AI teaching & learning lab: Custom bots

In this hands-on learning lab, you will apply concepts from the *How AI Works* mini-course to create an AI-powered custom chatbot to use in the context of your teaching. You’ll explore several sample bots for varied teaching-related use cases and consider aspects of your teaching where a custom chatbot would (or would not) support your goals. The bulk of our time will be spent creating, testing, and revising your own custom bot. You’ll leave with a prototype and the knowledge to build additional bots for new tasks.

AI research lab: Evaluating tools for research

Where do AI tools fit in your research workflow? Which research tools use AI? What tools and resources are available to you at Penn and via Penn Libraries specifically? Join this session for a practical understanding of if, when, and how to incorporate AI tools into your research with some guided multidisciplinary examples.

Schedule

Tuesday, June 2

Academic Research Building room 140

Time	Activity
9:30-10:00	Intro/arrival/housekeeping
10:00-11:00	Module 1 (Bhuvnesh Jain)
11:00-12:00	Module 2 (Bhuvnesh Jain)
12:00-1:00	Lunch on your own
1:00-2:00	Module 3 (Bhuvnesh Jain)
2:00-3:00	Module 4 (Chris Callison-Burch)

Wednesday, June 3

Academic Research Building room 140

Labs: Academic Research Building rooms 140/101

Time	Activity
9:30-10:00	Intro/arrival/housekeeping
10:00-11:00	Module 5 (Laura Zarrow)
11:00-12:00	Module 6 (Bhuvnesh Jain)
12:00-1:00	Lunch on your own
1:00-2:30	Small group labs (Rachel Hoke Jajwalya Karajgikar)
2:30-3:00	Whole group wrap-up (Bhuvnesh Jain)