PennState Institute for Computational and Data Sciences

Center for Artificial Intelligence Foundations & Scientific Applications
Artificial Intelligence Research Laboratory

PennState Clinical and Translational Science Institute

ARTIFICIAL INTELLIGENCE

The Very Idea

Vasant G. Honavar
Dorothy Foehr Huck and J. Lloyd Huck Chair in Biomedical Data Sciences and Artificial Intelligence
Professor of Data Sciences, Informatics, Computer Science, Bioinformatics & Genomics and Neuroscience
Director, Artificial Intelligence Research Laboratory
Director, Center for Artificial Intelligence Foundations and Scientific Applications
Associate Director, Institute for Computational and Data Sciences
Pennsylvania State University

vhonavar@psu.edu
http://faculty.ist.psu.edu/vhonavar
http://ailab.ist.psu.edu

Artificial Intelligence – The Very Idea

- Focus of the course
  - Demystifying AI
    - Basic knowledge of how AI works
    - Ethical and societal implications of AI
  - NOT the engineering of AI systems
- What you hopefully learned
  - Intellectual roots of AI
  - Disparate goals of AI
  - Many types of AI and their applications
  - The risks and benefits of AI technologies
  - The societal impacts of AI technologies
  - How to tell AI science from science fiction
  - How to have an informed conversation about AI

What did we learn?

- Intelligence - Natural and artificial
  - What is intelligence?
  - Theories of intelligence
  - Goals of artificial intelligence
  - Measures of artificial intelligence – Turing test etc.
- Computation and intelligence
  - What is computation?
  - Machines that compute
  - Logic functions, automata, Turing machines
  - Computational theory of minds
  - A brief history of AI

What did we learn?

- Hierarchy of intelligent agents
- Knowledge representation
  - What is knowledge representation?
  - Kinds of knowledge representation and the inferences they support
- Problem-solving machines
  - Finding a solution
  - Finding an optimal solution
  - Problem decomposition
  - Heuristics
  - Constraint satisfaction

What did we learn?

- Reasoning with knowledge
  - Reasoning with rules
  - Reasoning with logic
  - Reasoning with probabilities
- Learning machines
  - Supervised learning
    - Nearest neighbor classifier
    - Naïve Bayes classifier
    - Linear classifier
    - Decision tree classifier

What did we learn?

- Language models
  - Small language models
  - Large language models
  - Promise and pitfalls of language models
- Promises and pitfalls of AI
  - Ethics of AI
  - AI and future of work
  - Will machines replace humans?
  - How to get AI to empower humans?

What did we learn?

If you are not technically inclined

- Hopefully, the course demystified AI for you
- You are a little bit better prepared
  - To deal with the world being transformed by AI
  - To engage in informed conversations about the promise, potential and pitfalls of AI

If you are technically inclined – like math, programming

- The course whetted your appetite for learning more about AI
- You got a glimpse of what lies under the hood of AI systems
- You are a little better prepared to
  - Contemplate whether a career in AI might be right for you
  - Whether you want to get into upper-level AI courses or even a new BS in AI Methods and Applications scheduled to launch in fall 2025

Pursuing AI beyond this course

- Take upper-level undergrad AI courses and/or pursue a BS in AIMA
- If you are interested in a summer research opportunity, there are many options
  - https://cra.org/cra-wp/dreu/ (Next Deadline Feb 25)
  - https://tinyurl.com/computing-research (a large list of summer research opportunities for undergrads)
  - Local opportunities including in my lab
- Consider pursuing a graduate degree if you want to shape the future of AI
  - Here is some material that might help you think through whether grad school may be right for you
    - https://faculty.ist.psu.edu/vhonavar/grad-advice.html
- If you stop by my office hours, I'd be happy to chat with you

A few remarks about the final

- Homework 10 and the quiz will be graded by tomorrow
- Final will be online, administered on Canvas
  - Scheduled for 12/16/2024, 6:50pm through 8:40pm
  - Available at 6:45pm and will be locked at 8:45 pm
- Exam will cover materials from lectures 1 through 21
- Expect 5-6 problems similar to the homework problems
- You should be able to do well if you have mastered the material from the lectures and required readings

Miscellany

- If you want to have a copy of the course notes for your personal use, please download it from canvas and save it
- You can reach out to me for an updated version at the end of summer 2025
- Please fill out the course evaluation
  - This is the first time this material has been taught anywhere as a freshman course with no prerequisites
  - The goal is to offer an introduction to AI for all majors
  - Constructive feedback would be most helpful as we finetune the content and presentation