CS440/ ECE 448 Lecture 1: Introduction to AI

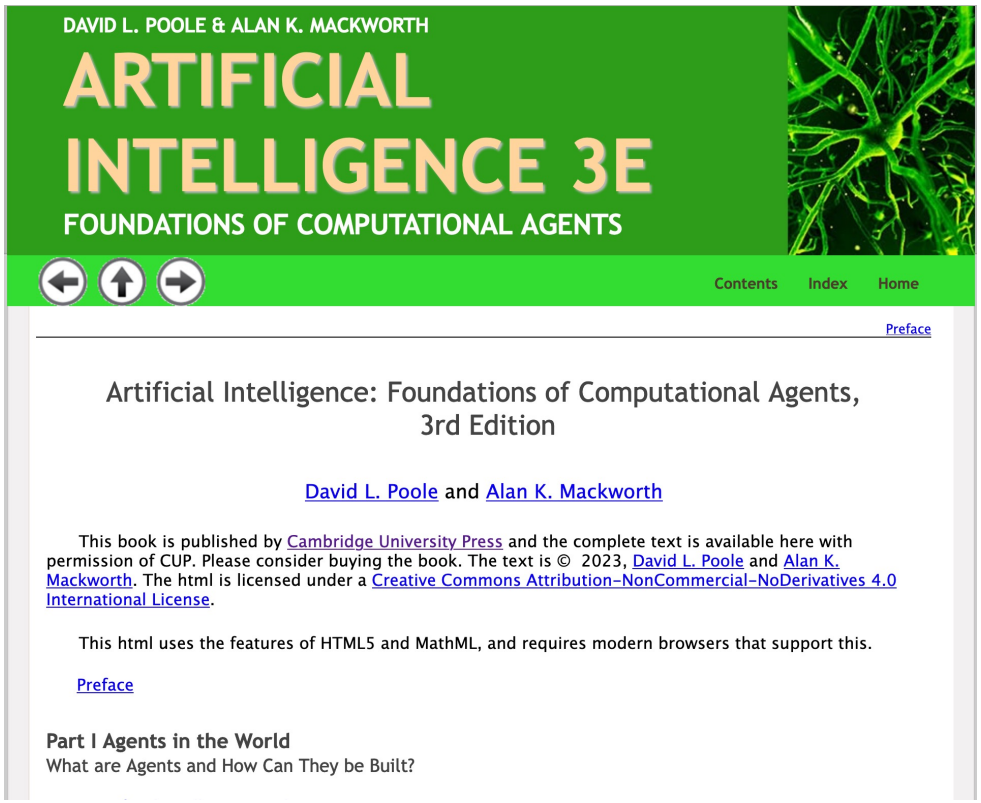
Mark Hasegawa-Johnson, 2026

Public domain image, https://commons.wikimedia.org/wiki/File:Robonaut_and_astronaut_hand_shake.jpg

Outline

- Syllabus
  - Text
  - Web Page, Office Hours, and CampusWire
  - Grades: Quizzes, MPs, Exams, and Project
- What is AI?
  - Definitions of intelligence
  - The Golem vs. Frankenstein's Monster
  - Environment

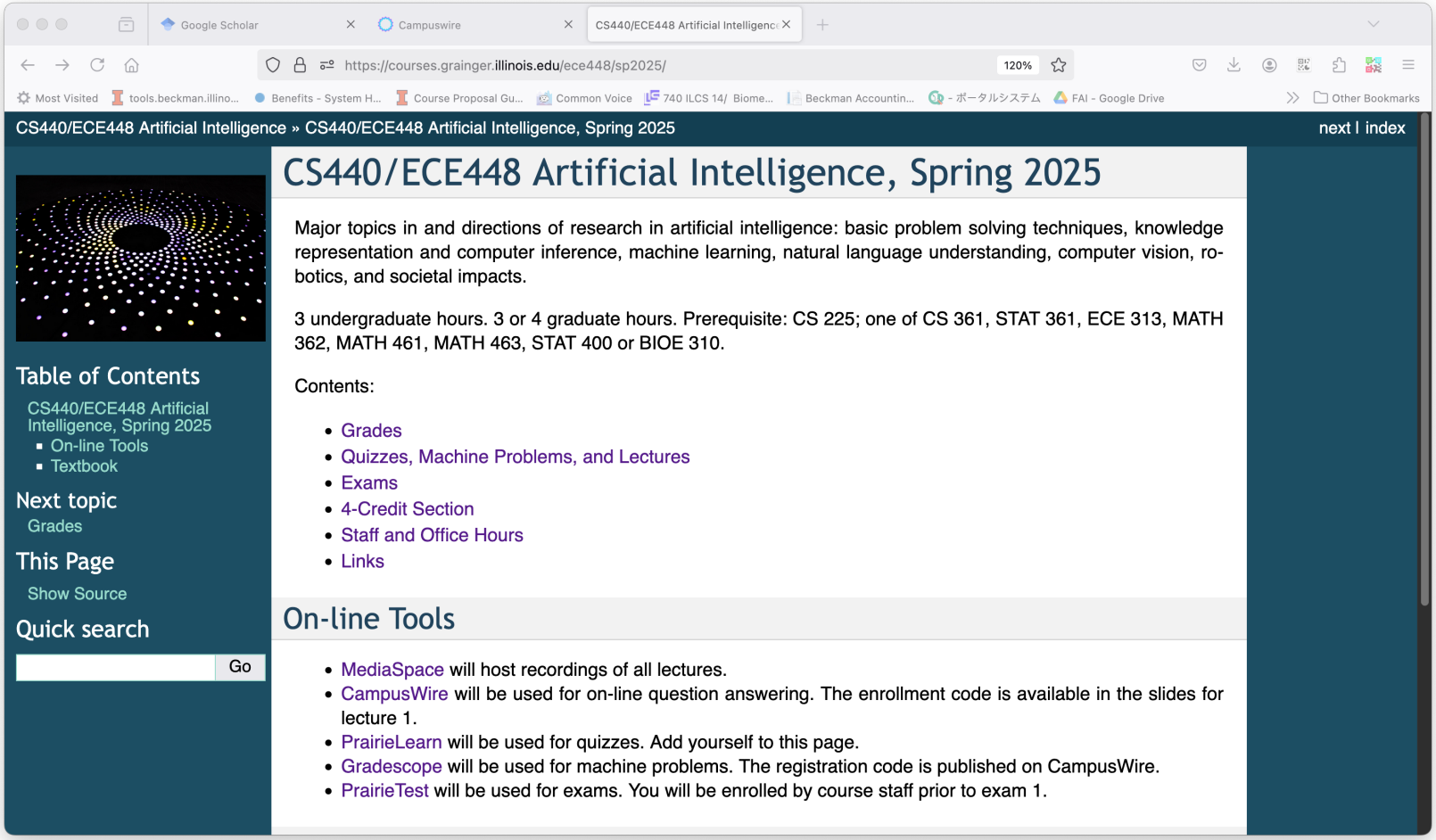
Textbook



Artificial Intelligence 3E by Mackworth & Poole

- Readings will be specified for each lecture.
- Readings are optional; required material is on slides, quizzes & MPs
- Textbook is free online, so you may find its coverage of some material helpful

Webpage: https://courses.grainger.Illinois.edu/ece448

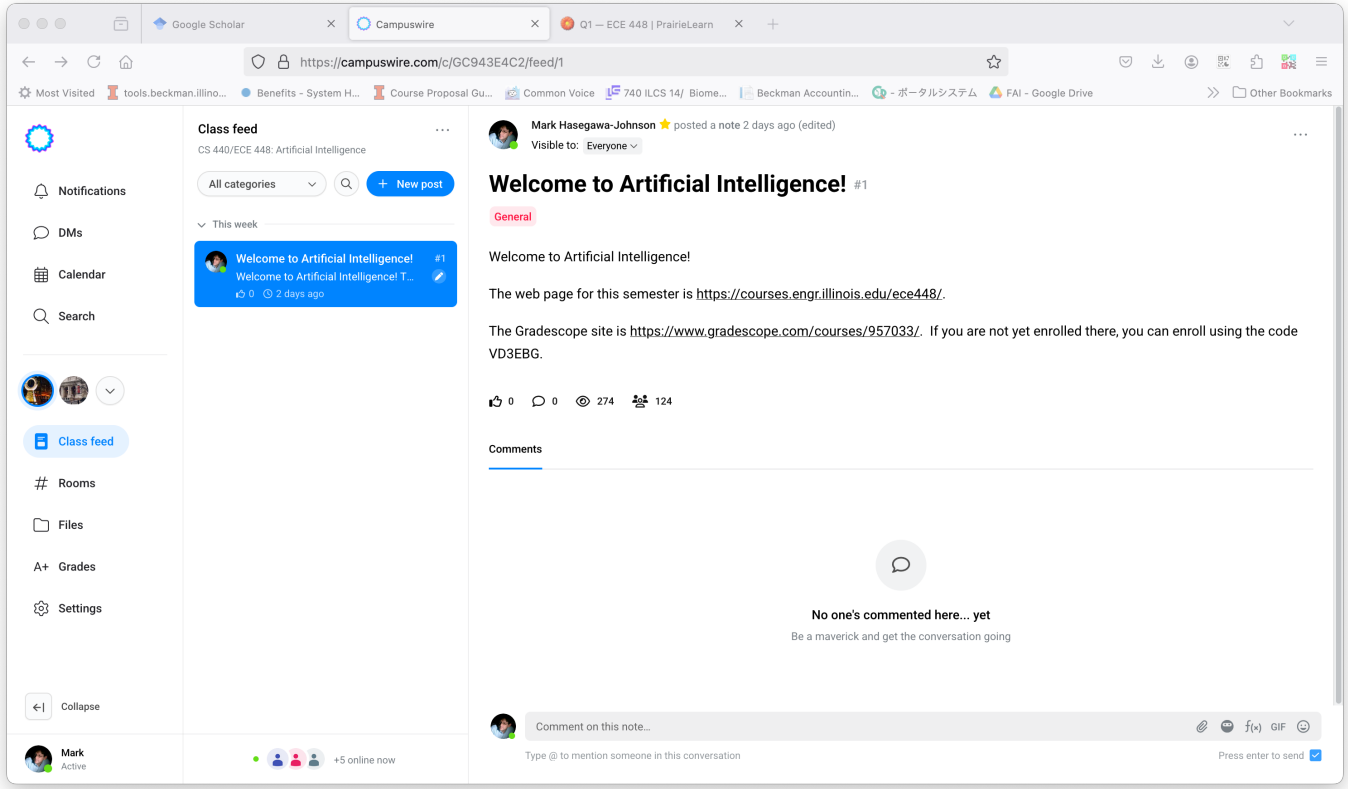


CampusWire

Add yourself to CampusWire if you're not already added:

https://campuswire.com/p/G490A8A0C

Code 4136.



Grading: Quizzes, MPs, Exams, Project

- Quizzes: 20% of 3-credit grade
  - Every lecture will have a quiz. Do it in class if you can.
  - Due: 23 hours after the end of lecture.
- Machine Problems: 25% of 3-credit grade
  - There will be 12 MPs in total
  - Due: Every Friday at midnight starting 2025/01/30
- Five Exams: 55% of 3-credit grade
  - 2 in-person midterms, 2 CBTF midterms, Final will be in person
- Independent Research Project: 100% of the 4^{th} credit
  - Information is on the course web page

More about daily quizzes

- The first one is available to you now at PrairieLearn --- see the link on the course web page labeled '21-Jan'.
- If you aren't yet signed in to the course, you can sign in to PrairieLearn using self enrollment link https://us.prairielearn.com/pl/course_instance/206566/join/MEWZJ7K9MP with code MEW-ZJ7-K9MP
- I will usually do the quizzes together with you in lecture (e.g., I'll work on this one later in today's lecture), but not always. Even if I don't do the quiz in lecture, there is always a quiz.
- Late penalty (starting 2026/02/05): If your quiz is finished more than 23 hours late, it suffers a 20% late penalty.

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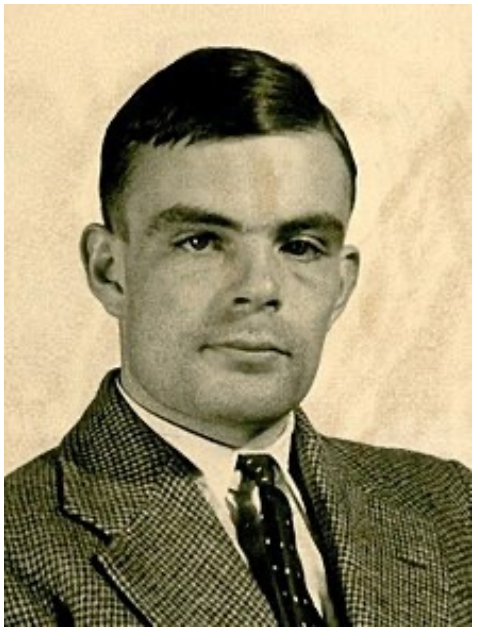
The Turing Test



‘Can machines think?’

I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words. The object of the game for the interrogator is to determine which of the other two is the machine. The interrogator is allowed to put questions thus:

C: Will A please tell me the length of his or her hair?

It is A’s object in the game to try and cause C to make the wrong identification. His answer might therefore be:

A: My hair is shingled, and the longest strands are about nine inches long.

Will the interrogator decide wrongly? This question replaces our original, ‘Can machines think?’

- Alan Turing, 1950

Is AI intelligent?

Are ChatGPT, Claude, and/or Gemini intelligent?

Definitions of intelligence

“The ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought.”

- American Psychological Association, 1995

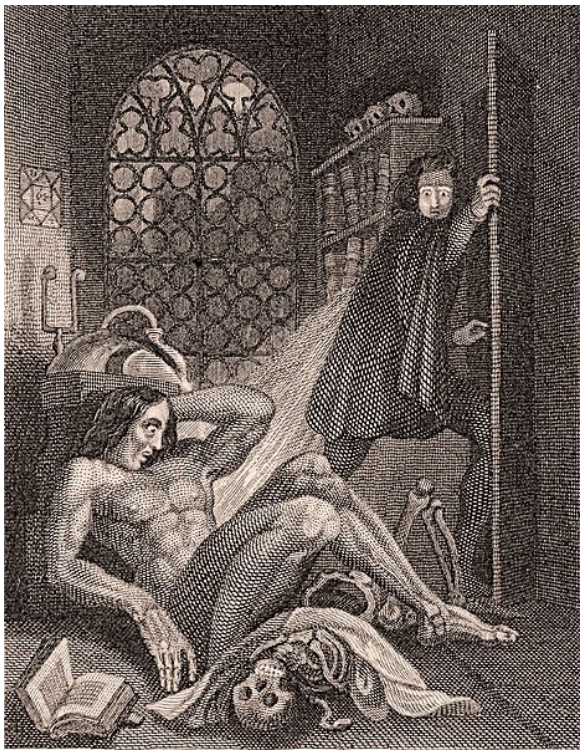
“Intelligence measures an agent's ability to achieve goals in a wide range of environments.”

- Shane Legg and Marcus Hutter, 2007

Others: https://en.wikipedia.org/wiki/Intelligence

The Golem vs. Frankenstein's Monster

https://commons.wikimedia.org/wiki/File:Mdm._Tussauds_Prag_8.jpg



https://commons.wikimedia.org/wiki/File:Frontispiece_to_Frankenstein_1831.jpg

The Golem vs. Frankenstein's Monster

The Golem:

- When given a goal by its creator, completes the task, often creatively, despite unexpected obstacles
- Does not know whether its actions are good or evil
- Sometimes, lacking knowledge of the distinction, achieves good ends using evil means

Frankenstein's Monster:

- Initially inchoate; Learns to walk by stumbling about; Learns language and love by listening to the family of a farmer
- Suffers after being rejected by Dr. Frankenstein
- In despair and loneliness, takes revenge by killing Frankenstein's wife

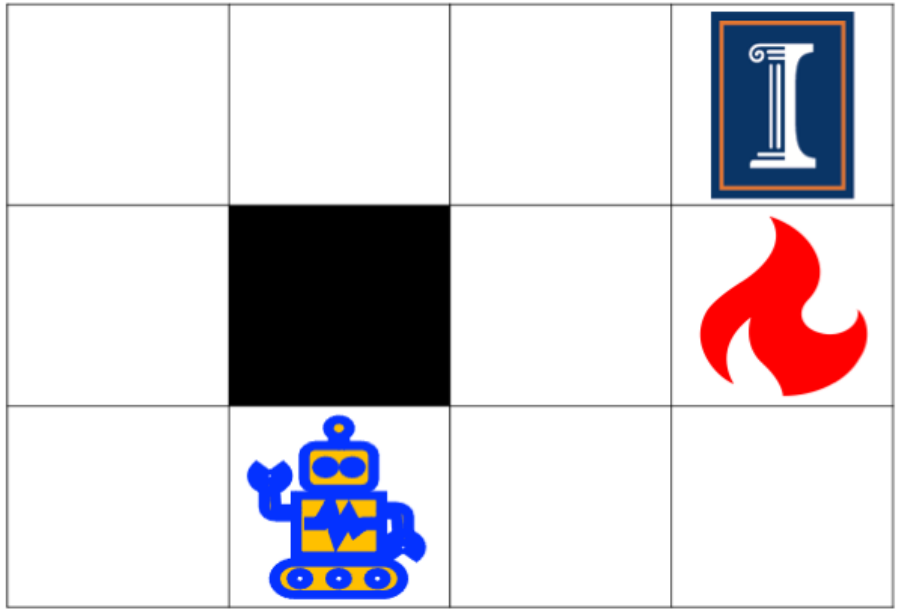
Questions to ponder

- What is understanding? Do AIs understand what they say?
- Can AI learn and use the difference between good and evil?
- If an AI invents evil means to achieve good ends, who is at fault?
- Creativity = Intentionality?

What kind of intelligence? = What kind of environment?

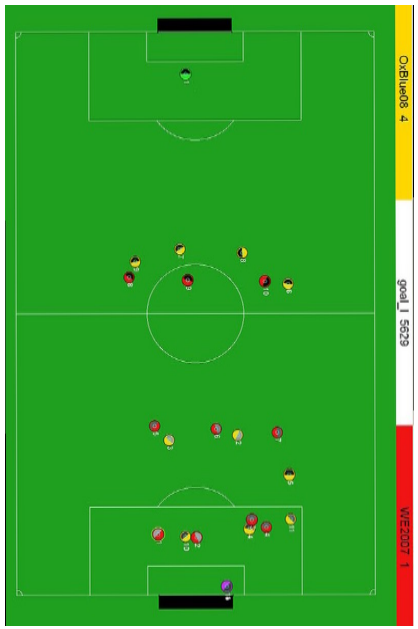
The environment in which an AI operates may be:

- Fully Observable vs. Partially Observable
- Deterministic vs. Stochastic
- Episodic vs. Sequential
- Static vs. Dynamic
- Discrete vs. Continuous
- Single agent vs. Multi-agent
- Known vs. Unknown

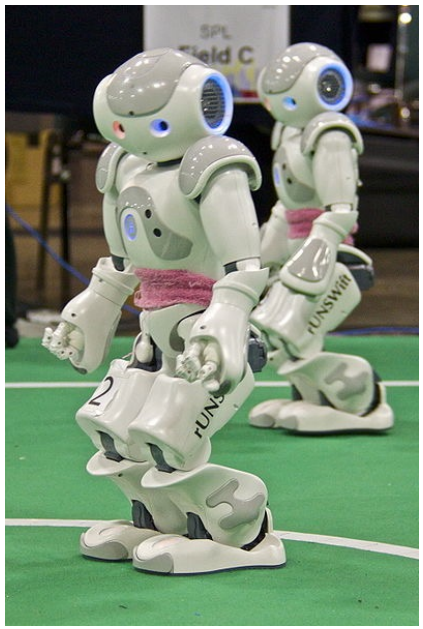


Fully observable vs. Partially observable

- Do the agent's sensors give it access to the complete state of the environment?
  - For any given world state, are the values of all the variables known to the agent?



vs.



Source: L. Zettlemoyer

Deterministic vs. Stochastic

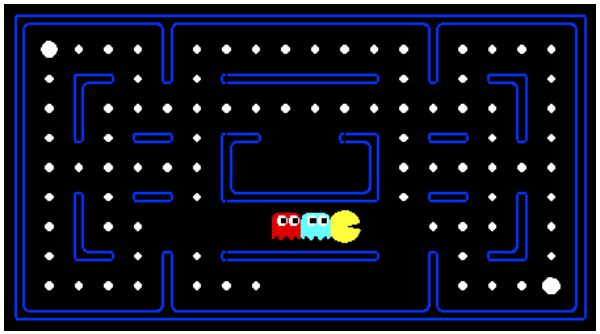
- Is the next state of the environment completely determined by the **current state** and the **agent's action**?
  - Is the transition model **deterministic** (unique successor state given current state and action) or **stochastic** (distribution over successor states given current state and action)?
  - **strategic:** the environment is deterministic except for the actions of other agents

vs.

Episodic vs. Sequential

- Is the agent's experience divided into unconnected episodes, or is it a coherent sequence of observations and actions?
  - Does the agent's action change the actions that will be available to it in the future, or the states in which it will perform those actions?

vs.



Static vs. Dynamic

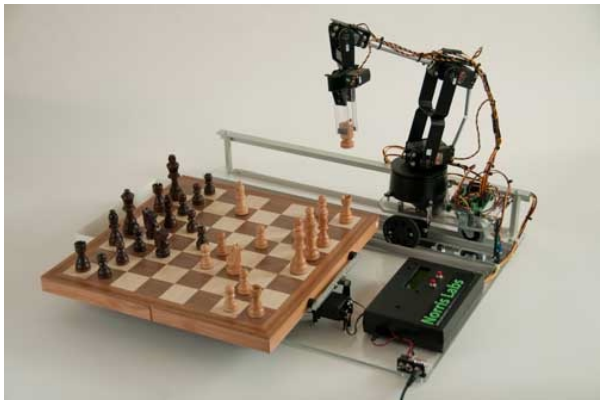
- Is the world changing while the agent is thinking?

vs.

Discrete vs. Continuous

- Does the environment provide a countable (discrete) or uncountably infinite (continuous) number of distinct percepts, actions, and environment states?
  - Are the values of the state variables discrete or continuous?
  - Time can also evolve in a discrete or continuous fashion
  - “Distinct” = different values of utility

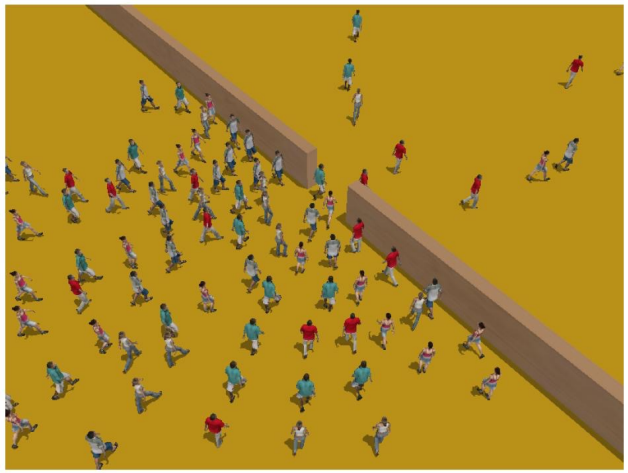
vs.



Single-agent vs. Multi-agent

- Is an agent operating by itself in the environment?

vs.



Known vs. Unknown

- Are the rules of the environment (transition model and rewards associated with states) known to the agent?
  - Strictly speaking, not a property of the environment, but of the agent's state of knowledge

vs.

Quiz question

Go to PrairieLearn

Add yourself to the course, if you're not already added

Try the quiz!