

CAP 5636 - The content and perspective of this class

Agent view of artificial intelligence

- We assume that there is an **agent**, an intelligent entity that has a **goal** and can take **actions**.
- The agent lives in a world that has a **state**, the agent can make **observations** about the state. There might be other agents in the world.
- The question we investigate: what actions should the agent take in the pursuit of its goals?

Examples:

- Agent: robot, environment: kitchen, goal: prepare breakfast
- Agent: car, environment: roads, goal: drive to work
- Agent: stock broker, environment: stock market, goal: maximize profit
- Agent: physician, environment: patient, goal: health of patient

Other perspectives of AI

- Theorem proving, logical reasoning, biological plausibility... and many others.
- Not a significant component of this class.

A conversation with ChatGPT

Me: You are at the side of a river, and have with you a **wolf** and a **cabbage**. There is a boat which only fits you and one item. How do you transfer the items safely to the other side?

ChatGPT: Here's how you can transfer the items safely across the river:

- Take the wolf across first and leave it on the other side.
- Go back alone and take the cabbage across.
- Bring the wolf back with you to the original side.
- Leave the wolf on the original side, and take the **sheep** across.
- Finally, go back and get the wolf.

Aug 19, 2024, ChatGPT-4o, paid version.

Circles, circles

- Understanding requires insight
- Insight requires context
- Context requires prior knowledge
- Learning proceeds through circles: you need to know a little bit about many things before you learn a lot about a certain thing.

This class is your first circle in AI

- We will cover many topics
- Does not require previous knowledge of AI
- Requires:
 - programming skills (eg. mid-level python)
 - being comfortable with math notation

If this is your second circle

- Eg. if you took the undergraduate AI class at UCF or elsewhere
 - ... then this is your second circle.
- We will likely revisit some topics you had previously seen

Relationship to the CAP 5611 Machine learning class

CAP 5611: classifying, estimating, predicting

$$\hat{y} = f(x, \theta)$$

- In general, with the assumption, that the θ is learned from data.

CAP 5636: taking actions

$$a = f(s, G, \theta)$$

- In general, with the assumption that the action a help accomplish a goal G .

CAP 5611 Machine learning

- Classification / regression with linear, logistic, K-nearest neighbors, decision trees
- Bias and variance, bagging, boosting
- Clustering, principal components
- Neural nets: multi-layer perceptrons, convolutional, recurrent
- Transformers, attention, LLMs

CAP 5636 Artificial intelligence

- Searching for a plan of action (uninformed, informed, heuristics, A*)
- Adversarial search, expectimax and game playing
- Markov decision processes, reinforcement learning, deep RL
- Probabilistic reasoning (including acting probabilistically)

One or the other or both?

- There are many cross-dependencies (remember circles-circles?)
- One of your initial homeworks will require you to watch several web-based lectures on machine learning
 - See it as an initial circle.

CAP 5636

- Instructor: Lotzi Bölöni <http://www.cs.ucf.edu/~lboloni/>
- Slides, homeworks, links etc:
http://www.cs.ucf.edu/~lboloni/Teaching/CAP5636_Fall2025/index.html
- Class hours: Tue, Th 12:00PM - 1:15PM CB1 0307
- Office hours: Tue, Th 1:30PM - 3:00PM HEC-319