

CSCI 3202: Intro to Artificial Intelligence

Lecture 1: Introduction

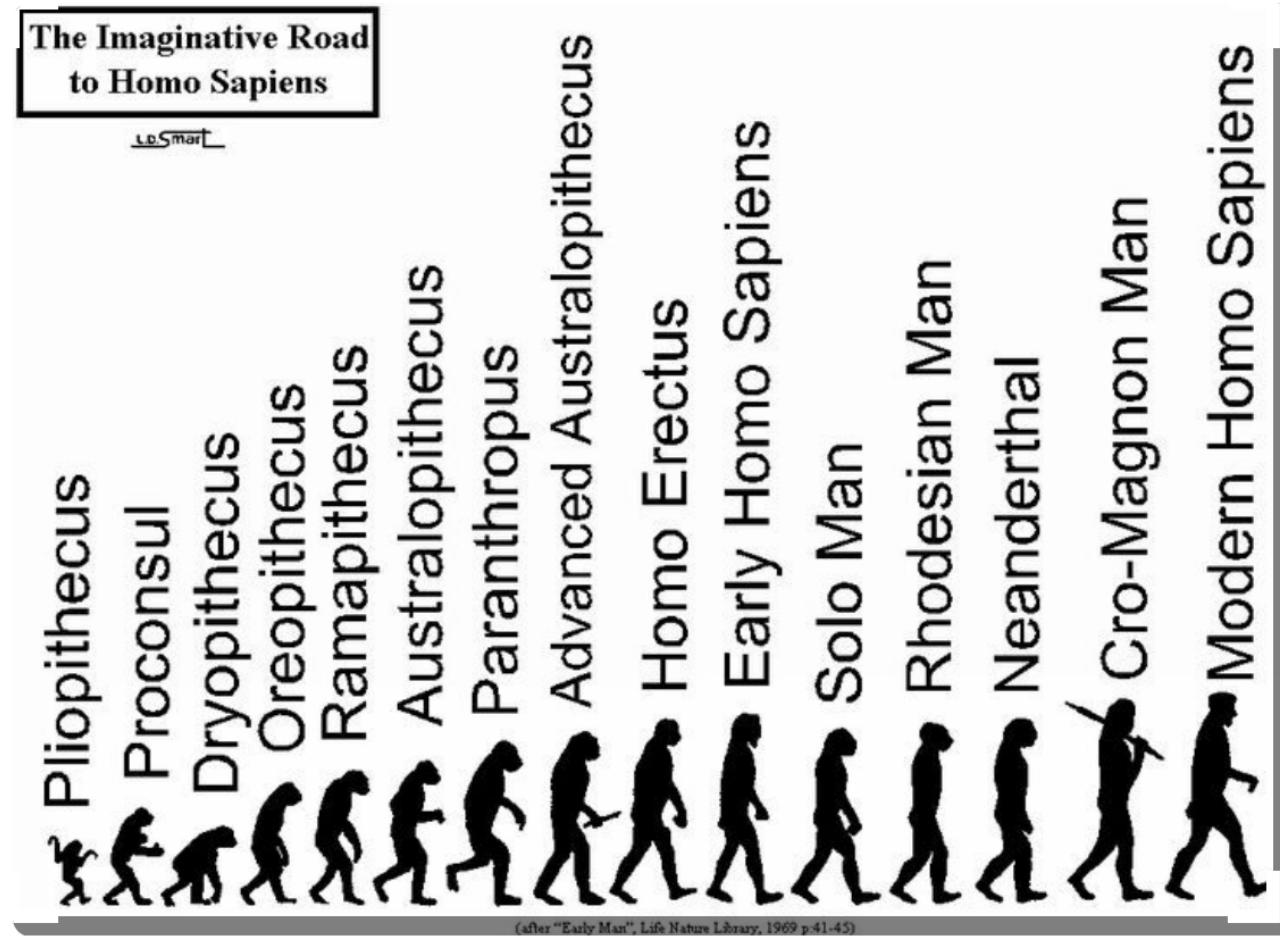
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What is Artificial Intelligence?

What is Intelligence?

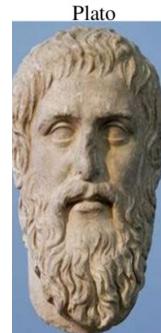
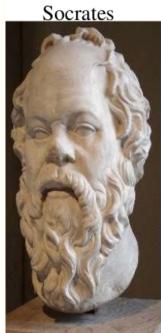
homo sapiens - “wise man”



Foundations of Artificial Intelligence

Philosophy

- Can formal rules be used to draw valid conclusions?
- How does the mind arise from a physical brain?
- Where does knowledge come from?
- How does knowledge lead to action?



Modus Ponens

$$\frac{p \quad p \rightarrow q}{\therefore q}$$

Modus Tollens

$$\frac{\neg q \quad p \rightarrow q}{\therefore \neg p}$$

Hypothetical
Syllogism

$$\frac{p \rightarrow q \quad q \rightarrow r}{\therefore p \rightarrow r}$$

From our book (pg. 6):

“It’s one thing to say that the mind operates, at least in part, according to logical rules, and to build physical systems that emulate some of these rules; it’s another to say that the mind itself is such a physical system. ...if the mind is governed entirely by physical laws, then it has no more free will than a rock “deciding” to fall toward the center of the earth.”

Foundations of Artificial Intelligence

This formula is known as **Bayes' Theorem**.

$$p(F | E) = \frac{p(E | F) p(F)}{p(E)}$$

Mathematics

- What are the formal rules to draw valid conclusions?
- What can be computed?
- How do we reason with uncertain information?

Thomas Bayes



Portrait purportedly of Bayes used in a 1936 book,^[1] but it is doubtful whether the portrait is actually of him.^[2] No earlier portrait or claimed portrait survives.

Foundations of Artificial Intelligence

Economics

- How should we make decisions so as to maximize payoff?
 - How should we do this when others may not go along with us?
 - How should we do this when the payoff may be far in the future?
- Later in the semester: Decision theory, Game theory, Markov decision processes

Neuroscience

- How do brains process information?

“brains cause minds” - John Searle

Psychology

- How do humans and animals think and act?

Foundations of Artificial Intelligence

Computer Engineering

- How can we build an efficient computer?
- For artificial intelligence to succeed, we need two things: intelligence and an artifact

Control Theory and Cybernetics

- How can artifacts operate under their own control?

Linguistics

- How does language relate to thought?

Foundations of Artificial Intelligence

"Acting Humanly"

- What does a computer need to pass itself off as human?

"Thinking Humanly"

- Need to get inside the actual workings of human minds.

"Thinking Rationally"

- What are the rules that govern correct thought?



What is rational?

Modern Approach: “Acting Rationally”

- Here “**rational**” means “**optimal**” - a rational system is one in which the system optimally achieves predefined goals.
 - maximally achieving pre-defined goals
 - only concerns what decisions are made, not why

Goals

- expressed in terms of quantifiable utility
- being rational means maximizing your expected utility

Maximize: evaluate all options and pick the best

Expected: decisions conditioned on available data → probability/statistics!

A few current problems

Speech/text recognition:

How do we categorize this new digit?



0 0 0 0 0 0 0 0 0 0 0 0
1 1 1 1 1 1 1 1 1 1 1 1
2 2 2 2 2 2 2 2 2 2 2 2
3 3 3 3 3 3 3 3 3 3 3 3
4 4 4 4 4 4 4 4 4 4 4 4
5 5 5 5 5 5 5 5 5 5 5 5
6 6 6 6 6 6 6 6 6 6 6 6
7 7 7 7 7 7 7 7 7 7 7 7
8 8 8 8 8 8 8 8 8 8 8 8
9 9 9 9 9 9 9 9 9 9 9 9

A few current problems

Computer Vision:

Is this vehicle a threat?



A few current problems

Autonomous Vehicles:



Autonomous car hits autonomous robot in bizarre collision

January 7, 2019 - By [Tracy Cozzens](#)

[0 Comments](#)

Est. reading time: 1:30 

In a unique car accident, a self-driving Tesla Model S hit and destroyed an autonomous [Promobot](#), the robot model v4, on Jan. 6 in Las Vegas. The incident took place at 3000 Paradise Road, Las Vegas.

Course Logistics – Grading Breakdown

Workload:

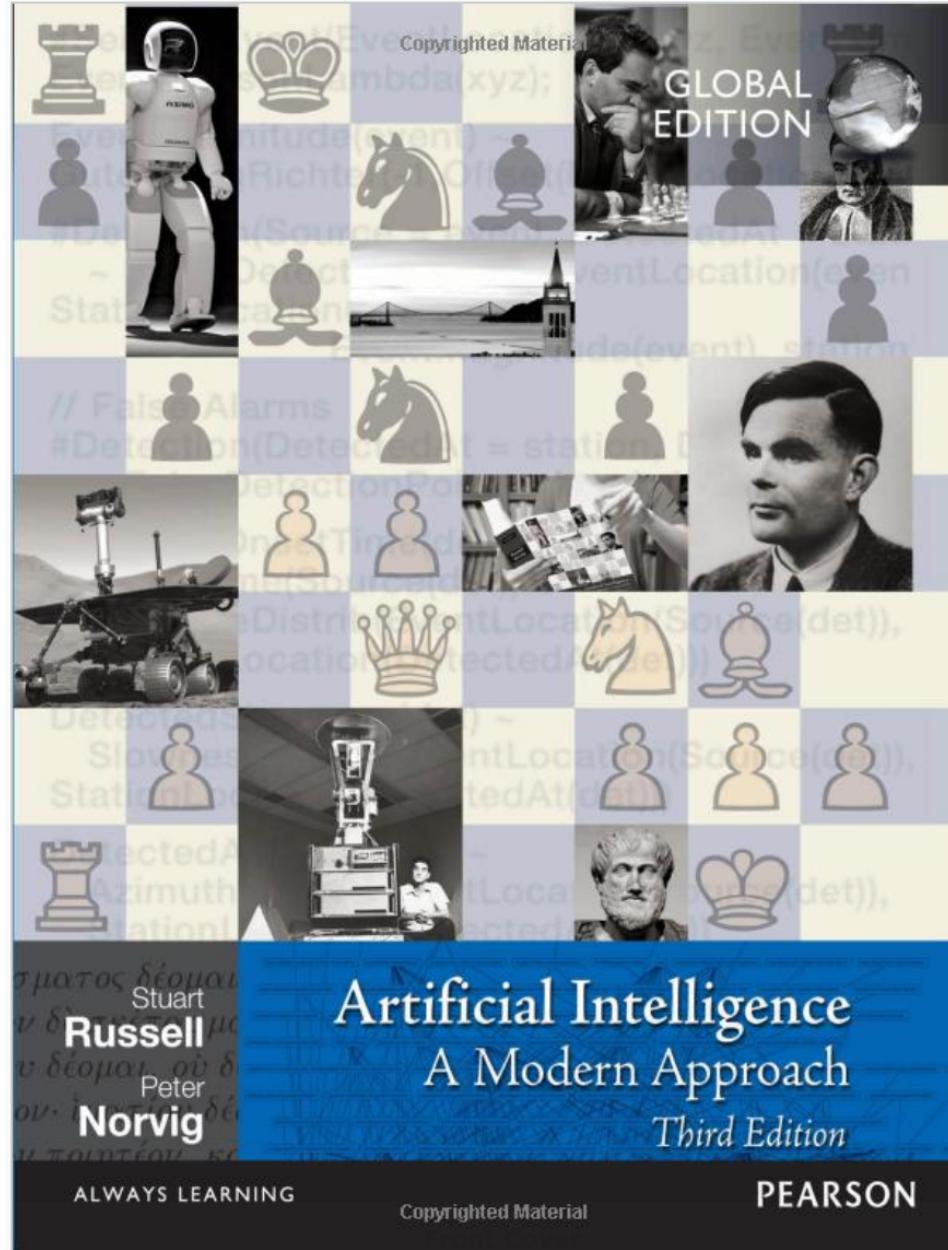
- (40%) Homework assignments (roughly one every 2 weeks)
- (20%) Midterm exam
- (20%) Endterm exam (not cumulative, but assumes knowledge of all material)
- (10%) Final practicum (cumulative)
- (10%) Quizlets (Moodle)

Must have 55% or higher exam average in order to earn a C- or higher in the class

Let me know about any special needs in a timely manner

Read the syllabus! More details can be found there regarding course policies

Course Logistics – Book



Course Logistics – Computing

- We will use **Python 3** and in particular **Numpy** and **Pandas**
- Lots of great data science libraries and decent plotting
- **We'll work exclusively in Jupyter Notebooks**
- Easiest way to get Jupyter is **Anaconda Python 3.6**; we strongly recommend you install local copy
- If not, you can use **Microsoft Azure** or **Google Colab** notebooks
- We will often work on problems in groups during class
- Bring a laptop, or have a friend with a laptop



Course Logistics – Computing

- Homework assignments will be done through Jupyter Notebooks

Install Jupyter Notebook on your computer

- [Jupyter Notebook](#)
 - [Anaconda Python](#) (includes Jupyter)
-
- Back your work up!
 - Github, Google Drive, SOMEthing
 - Make the repo **private** (collaboration policy)

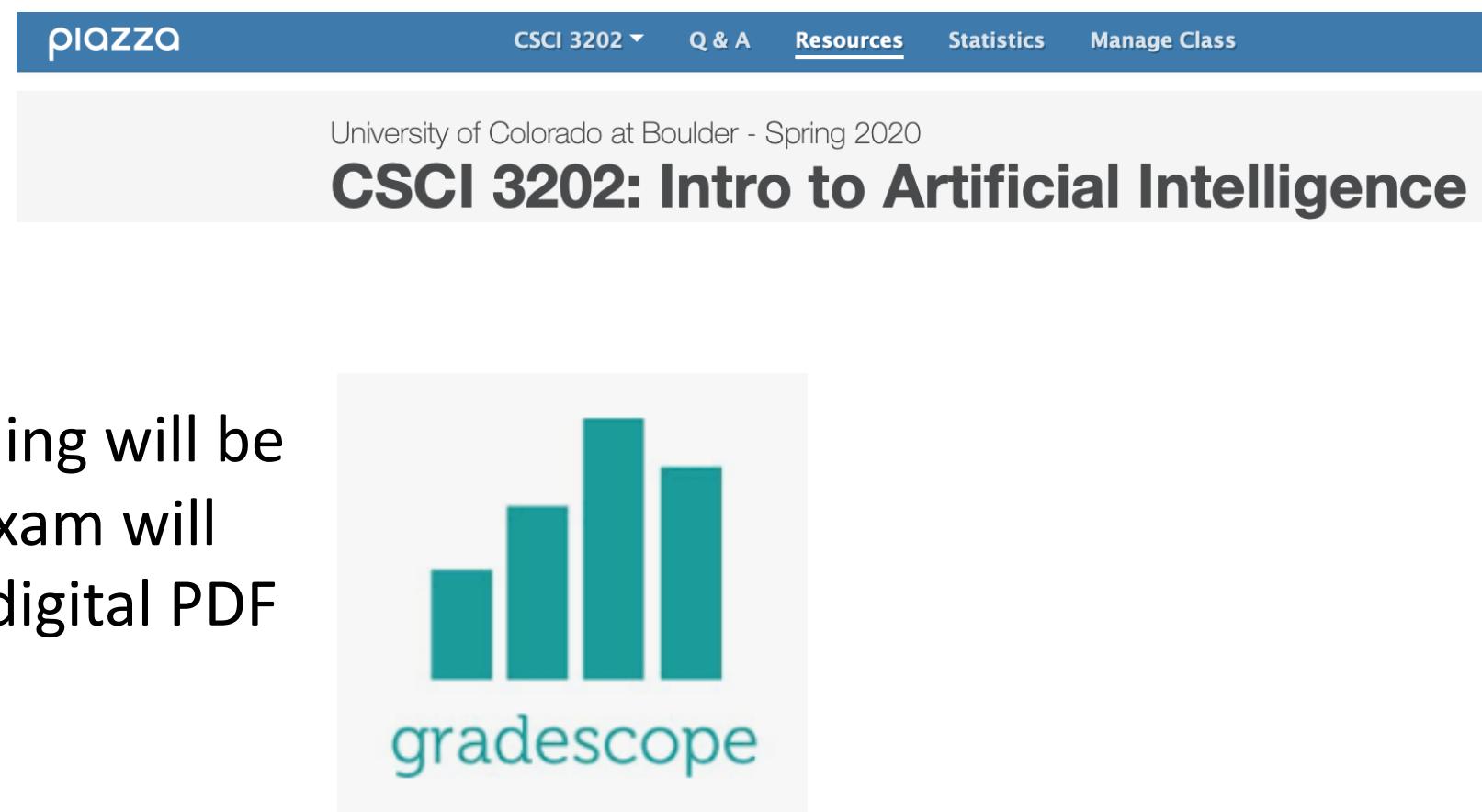


Course Logistics – Platforms

1) [Moodle](#) - Quizlets, Grades, Submission of Homework

2) [Piazza](#)– Class discussion forum. Discuss work, but do not post solutions/vital code

3) Gradescope – Exam grading will be done here. Your paper exam will be returned to you as a digital PDF



Course Logistics – Schedule

Check the [schedule](#) often. This is where slides, homework, and quizzes will be linked.

	Date	Reading	Optional	Topic	Slides	Homework
1	Jan. 13	Ch 1 (skim)		Introduction		
	Jan. 15	Ch 2 (skim)		Agents, perception		
	Jan. 17	3.1-3.2		States		
2	Jan. 20			Martin Luther King Jr. Day - No Class		
	Jan. 22			Agents - intro NB Day		
	Jan. 24			Agents - NB Day		
3	Jan. 27	3.4		Breadth-first search		
	Jan. 29	3.4		Depth-first search		
	Jan. 31	3.4		Uniform-cost search		Homework 1

Course Logistics – Academic Integrity

See the [CU Academic Integrity Policy](#) for more details. Here are some highlights.

- “Examples of cheating include: copying the work of another student during an examination or other academic exercise (includes computer programming)”
Bad
- “Examples of plagiarism include: [...] copying information from computer-based sources”

- For an assignment, Maciej and Felix work together to figure out how to implement the codes, but each works on their own computer and develops their own software.
Good
- For an assignment, Rhonda has a plan for how to implement an algorithm, but isn’t sure how to manipulate a Python list in a particular way that she needs to. She searches the internet, finds a fix, and implements it in her code without copying it.

Course Logistics – Laptops in Class

“Results showed that students who used laptops in class spent considerable time multitasking and that the **laptop use posed a significant distraction to both users and fellow students**. Most importantly, the level of laptop use was negatively related to several measures of students learning, including self-reported understanding of course material and overall course performance.”

<https://www.sciencedirect.com/science/article/pii/S0360131506001436>

Also: <https://journals.sagepub.com/doi/pdf/10.1177/0956797616677314>

Also: <https://www.sciencedirect.com/science/article/abs/pii/S0272775716303454>

If you are going to use a laptop (aside from the Jupyter notebook times) ...

- 1) Sit in the back
- 2) Try to stay focused...

Course Logistics – Before Next Class

- ❑ Read the [Syllabus](#). You are responsible for knowing the information contained in this document.
- ❑ Skim Chapter 1 & 2 of the textbook
- ❑ Make sure you can access the [Moodle page](#).
- ❑ Check out the [Piazza page](#).
- ❑ Install [Anaconda](#) (or other reliable Jupyter notebook method) if you don't already have one.