

# CSCI 3202: Intro to Artificial Intelligence

## Lecture 1: Introduction

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Welcome! We start at 10:10am.



# What is Artificial Intelligence?

What is Intelligence?

- Capability to adapt, learn
- utilize surroundings
- inheriting the best traits
- to think
- decision making
- take in and utilize data
- self-awareness
- response to stimuli

reinforcement learning  
search algorithms

homo sapiens - "wise man"

The Imaginative Road  
to Homo Sapiens  
LoSmart

genetic algorithms

Pliopithecus

Proconsul

Dryopithecus

Oreopithecus

Ramapithecus

Australopithecus

Paranthropus

Advanced Australopithecus

Homo Erectus

Early Homo Sapiens

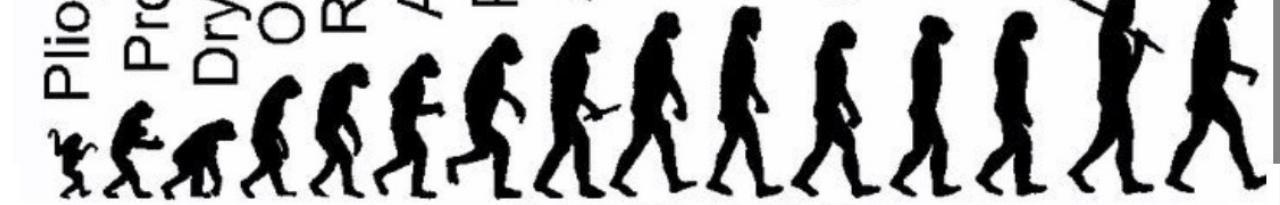
Solo Man

Rhodesian Man

Neanderthal

Cro-Magnon Man

Modern Homo Sapiens

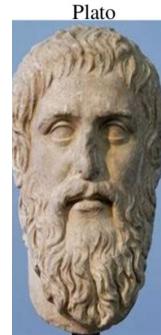
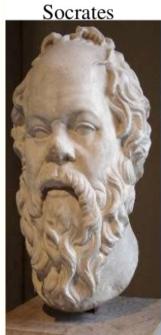


(after "Early Man", Life Nature Library, 1969 p.41-45)

# 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

$$\begin{array}{c} p \\ p \rightarrow q \\ \hline \therefore q \end{array}$$

Modus Tollens

$$\begin{array}{c} \neg q \\ p \rightarrow q \\ \hline \therefore \neg p \end{array}$$

Hypothetical  
Syllogism

$$\begin{array}{c} p \rightarrow q \\ q \rightarrow r \\ \hline \therefore p \rightarrow r \end{array}$$

From our book (pg. 6):

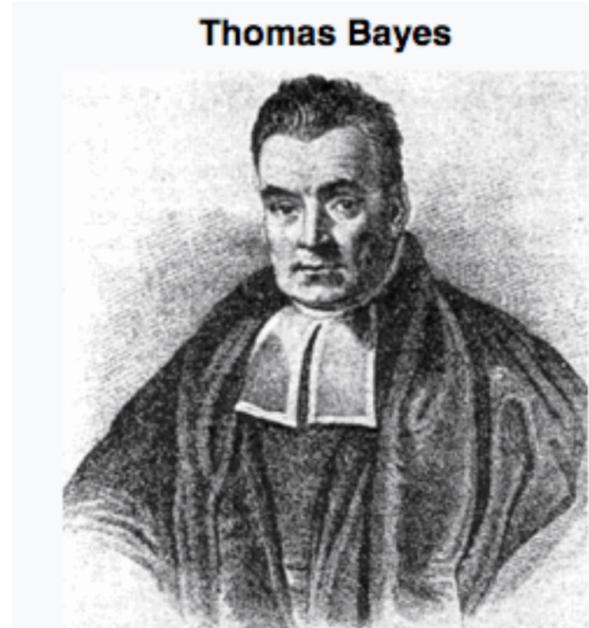
“It’s one thing to say that the mind operates, at least in part, according to logical rules, and to build physical systems that emulate some of these rules; it’s another to say that the mind itself is such a physical system. ...if the mind is governed entirely by physical laws, then it has no more free 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,<sup>[1]</sup> but it is doubtful whether the portrait is actually of him.<sup>[2]</sup> No earlier portrait or claimed portrait survives.

# Foundations of Artificial Intelligence

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## 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

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## 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?

natural  
language  
processing

# Foundations of Artificial Intelligence

"Acting Humanly"

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

Turing test -

"Thinking Humanly"

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

- introspection
- psychological experiments
- brain imaging

"Thinking Rationally"

- What are the rules that govern correct thought?

Rational behavior - doing the "right" thing



# What is rational?

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## 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

We will  
use this  
approach

Maximize: evaluate all options and pick the best

Expected: decisions conditioned on available data

→ probability/statistics!

local search – hill climbing

# A few current problems

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Speech/text recognition:

How do we categorize this new digit?



Gradescope

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

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Computer Vision:

Is this vehicle a threat?



# A few current problems

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Autonomous Vehicles:



↙  
trolley  
car

## 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.

## A few current problems

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NASA's Artemis 1 Lunar Mission:

### **Alexa, how far to the moon? Amazon uses its virtual assistant software to develop 'Callisto' artificial intelligence system for NASA's Artemis lunar mission**

- **Amazon is working with web firm Cisco and aerospace firm Lockheed Martin**
- **Callisto will combine Alexa's voice control with Cisco's video conferencing tech**
- **The demo will be placed in the Orion capsule for the uncrewed Artemis I mission**
- **Mission control personnel will test it remotely using a separate speaker system**
- **Those at home can follow the mission by asking Alexa 'How far to the moon?'**

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By [IAN RANDALL FOR MAILONLINE](#)

**PUBLISHED:** 14:23 EST, 6 January 2022 | **UPDATED:** 14:36 EST, 6 January 2022

[Source](#)

# A few current problems

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Other Examples of Current AI Projects:

## **27 Examples of Artificial Intelligence Shaking Up Business as Usual**

Sam Daley

August 9, 2021 • Updated: December 17, 2021

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# Course Logistics – Grading Breakdown

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## Workload:

5 HWS

drop lowest hw score

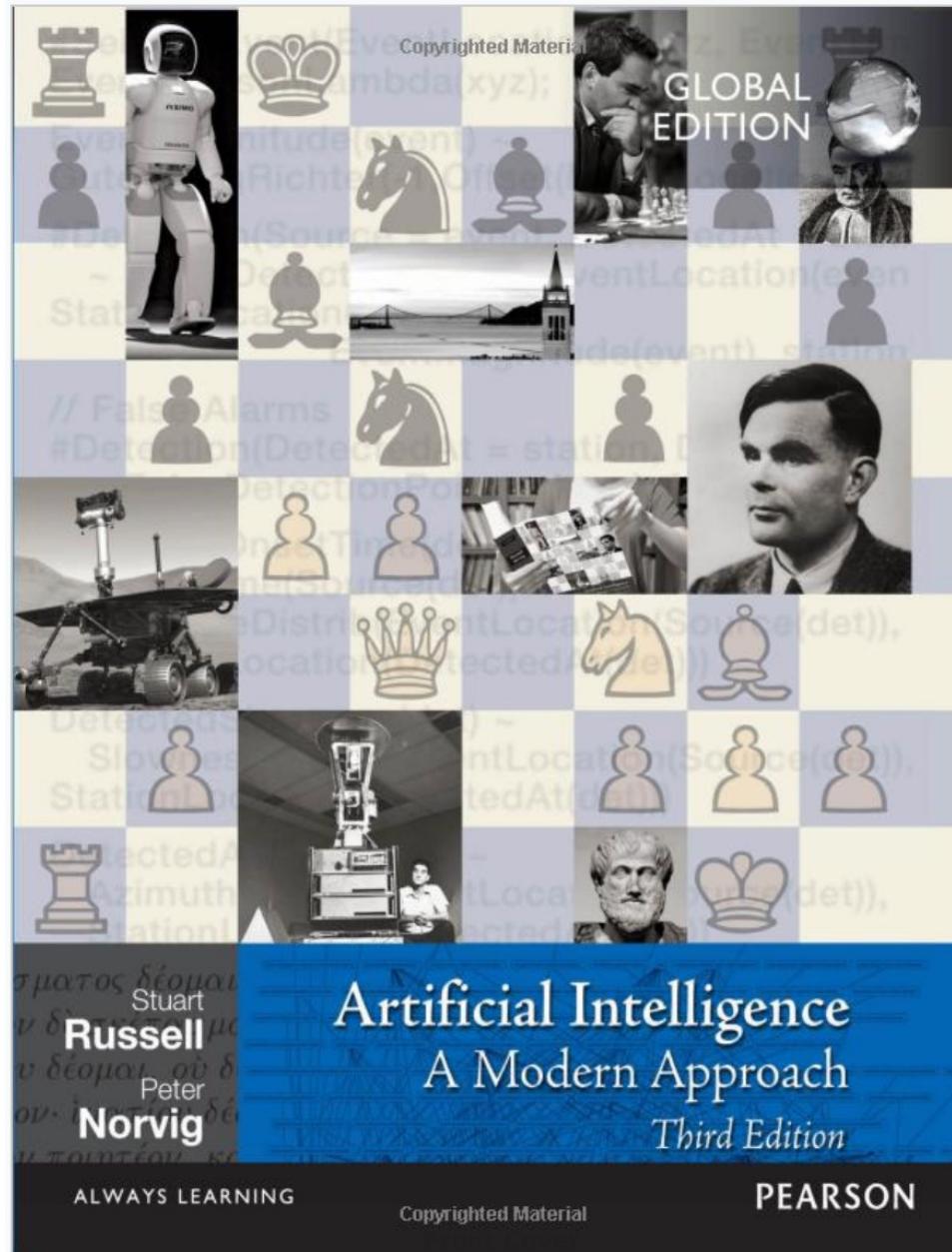
- Homework Assignments (60%) - roughly one every two weeks
- Midterm Exam (20%) - taken online
- Final Exam/Project (20%)

Feb 23-24

24 hours  
Gradescope

# Course Logistics – Book

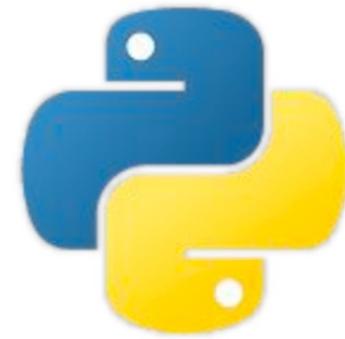
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# Course Logistics – Computing

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- 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



*• Coding.cscl.io...*

# Course Logistics – Computing

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- 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

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1) [Canvas](#) - Grades, Submission of Homework, Platform for Lecture Slides & Videos

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

3) Gradescope – We will be taking the midterm exam on Gradescope

The screenshot shows the Canvas course page for CSCI 3202-001,002. The top navigation bar includes links for 'CSCI 3202-001,002 ▾', 'Q & A', 'Resources' (which is underlined), 'Statistics ▾', and 'Manage Class'. On the right, there are buttons for 'Buy a License' and 'Switch to contribution model'. Below the navigation, it says 'University of Colorado at Boulder - Fall 2021' and 'CSCI 3202-001,002: CSCI 3202: Intro Artificial Intelligence'. There is also a '+ Add Syllabus' button and a lock icon.



# Course Logistics – Academic Integrity

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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

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“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

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- ❑ 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 [Canvas Page](#).
- ❑ Check out the [Piazza page](#).
- ❑ Install [Anaconda](#) (or other reliable Jupyter notebook method) if you don't already have one.