

CS 431: ARTIFICIAL INTELLIGENCE

Prof. Chambers

What is Artificial Intelligence?

Philosophical/Psychological Answer



- What properties are necessary for something to be considered intelligent?
- What is consciousness?
- Are humans intelligent? Conscious?

Pragmatic Answer

- What problems does the field of AI concern itself with?

Think like a human Cognitive Modeling	Think rationally Logic-based Systems
Act like a human Turing Test	Act rationally Rational Agents

Poster by

AAAI

Association for the Advancement of Artificial Intelligence

AI Magazine

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Microsoft Research



Optimizing Paths

Planning

Autonomous Vehicles

Humanoid Robots

Intelligent Tutoring

Robotic surgery

Search and Retrieval

Machine Translation

Assistive Technology

Recommender Systems

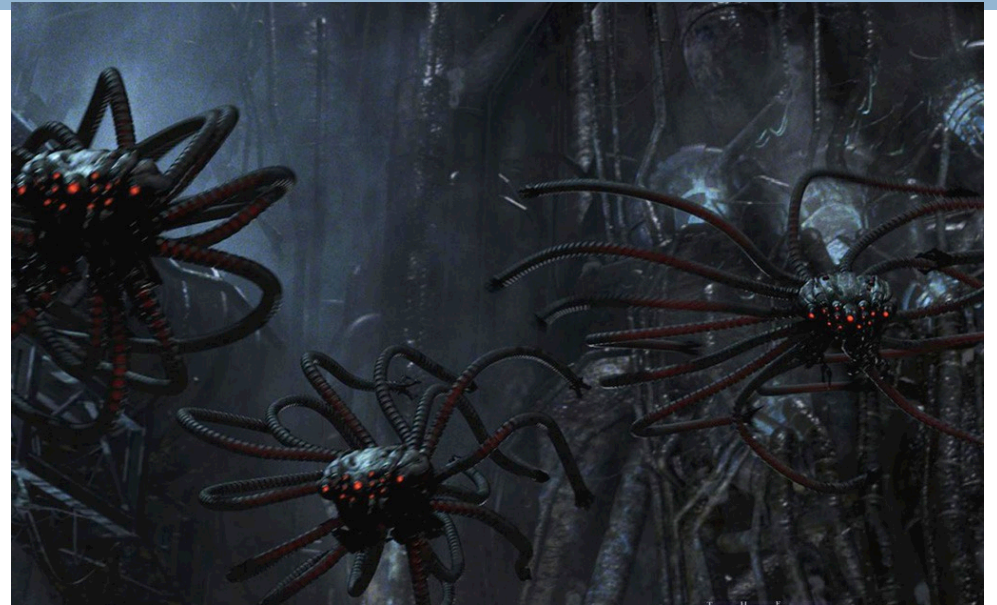
See the AI timeline and more at www.aaai.org/AIlandscape

The AI Landscape

David Leake, Indiana University, Poster Development Committee Chair
Poster Design: Giacomo Marchesi, www.GiacomoMarchesi.com

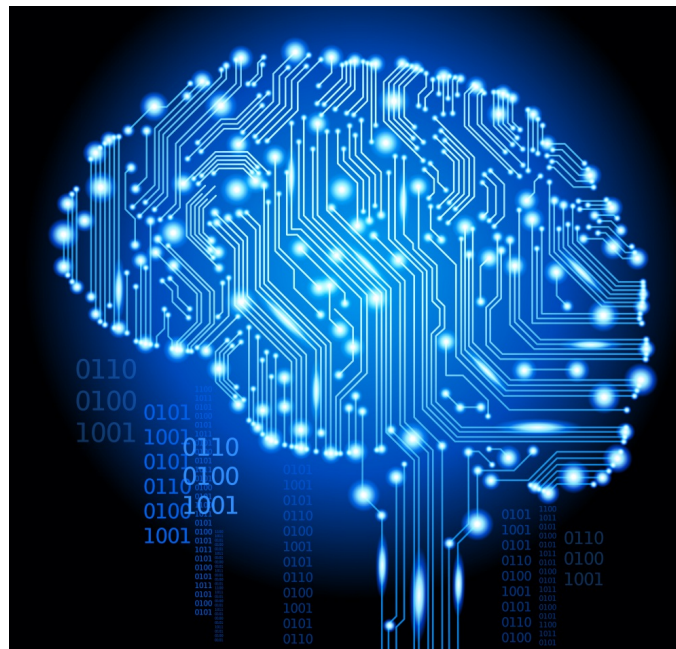


Pop Culture Answer

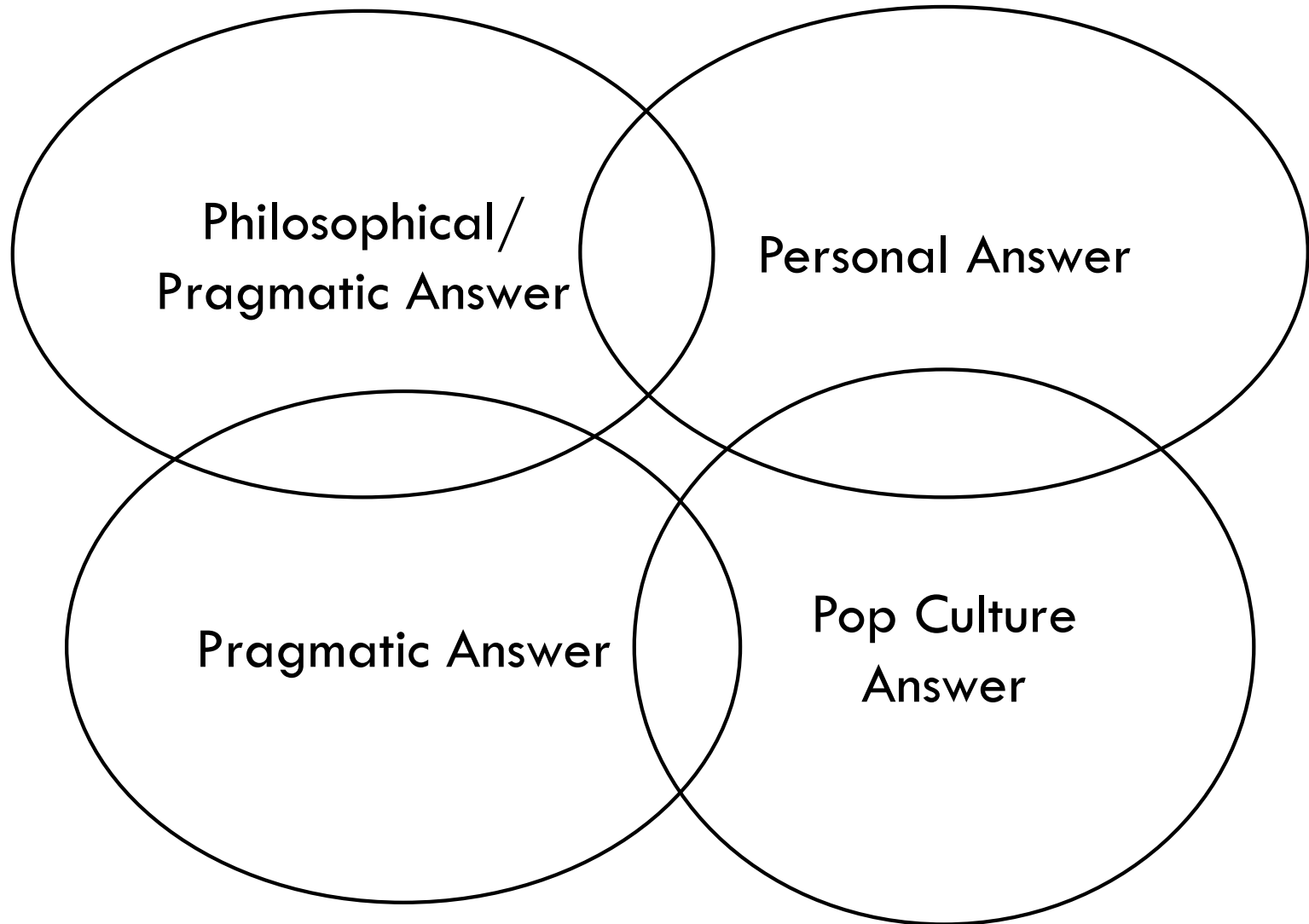


Personal Answer

- What image of AI is hidden in your mind and your imagination that drove you to take this class?



What is Artificial Intelligence?



What this class is **not** about



- We will **not** discuss the philosophical/psychological aspects of intelligence and consciousness
- We will **not** discuss the popular conceptions of AI (e.g. time travel, killer AI)
- We will **not** attempt to build a computer system that has some form of self-consciousness

What this class is about



We **will** study algorithms for solving computational problems, doing prediction, and learning from data



Subfields of AI

Natural Language Processing (NLP)

- Understanding
 - ▣ Speech recognition
 - ▣ Entity and co-reference resolution
- Generation
 - ▣ Automatic summarization
 - ▣ Natural language generation
 - ▣ Speech and gesture generation
- Other
 - ▣ Machine translation
 - ▣ Question answering
 - ▣ Sentiment analysis



Knowledge representation and common sense



- What would happen if I dropped my computer on the ground? How do you think I would react?
- How do you get common sense into a computer?
- Opencyc.org
- [OpenMindCommonSense \(OMCS\)](http://OpenMindCommonSense.com)

Knowledge representation and common sense

The screenshot displays the MCCARTHY Cyc KB Browser interface. At the top, the browser window title is "MCCARTHY Cyc KB Browser - Microsoft Internet Explorer". The address bar shows the URL "http://opencyc251.homeslinux.org:3603/cgi?cb-start". The main content area is titled "Collection : RoadVehicle".

On the left side, there is a navigation pane with the following items:

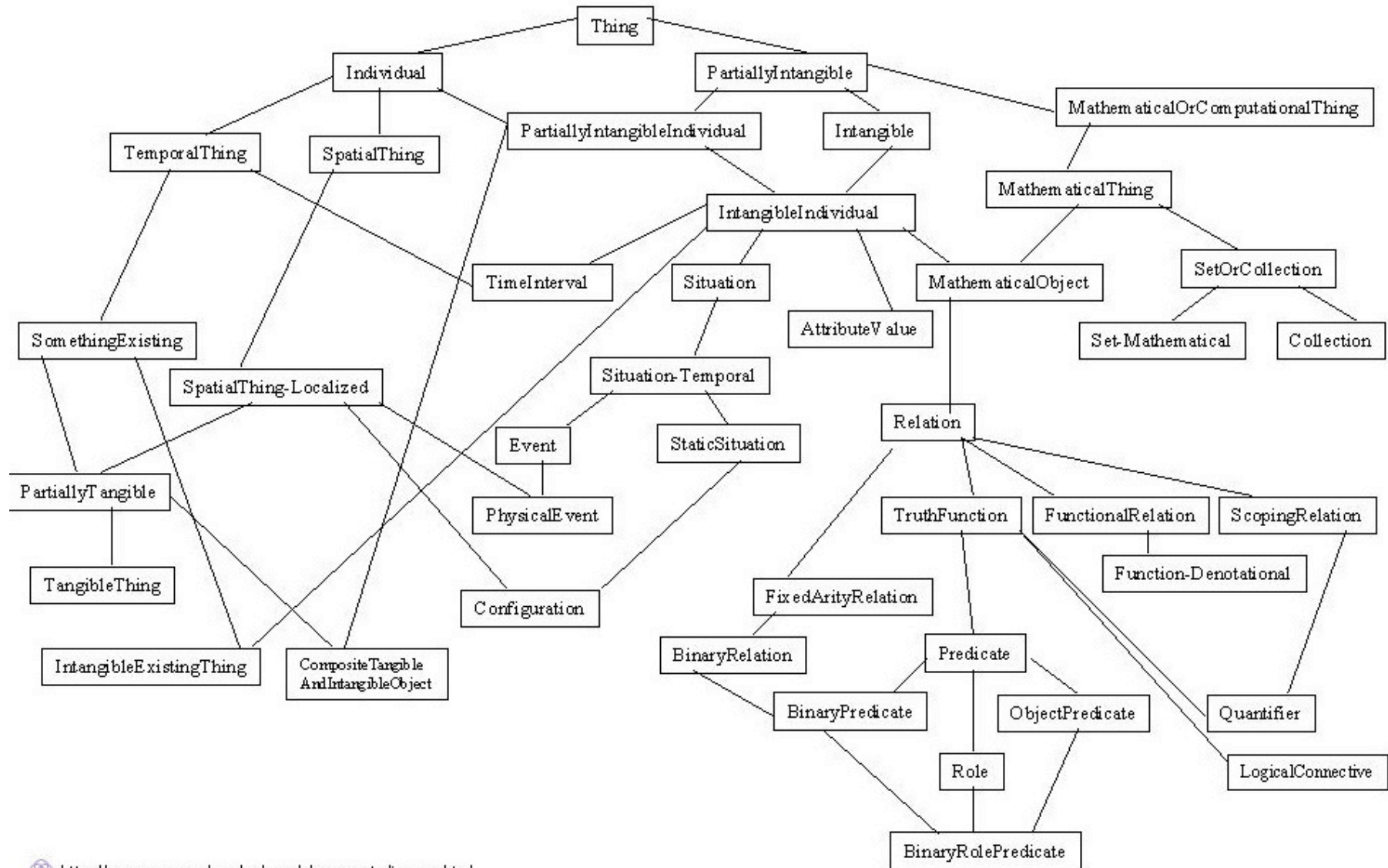
- RoadVehicle** (with a small icon)
- Index**
- Viewpoint Filters :**
 - [\[Create Similar\]](#) [\[Rename\]](#) [\[Merge\]](#) [\[Kill\]](#)
 - [\[Force TMS\]](#) [\[Lexify\]](#) [\[EL Formulas\]](#)
- [Documentation](#)
- [Definitional Info](#)
- [Lexical Info \(8\)](#)
- [Applicable Relations](#)
-
- [All Asserted Knowledge \(33\)](#)
-
- [All KB Assertions \(33\)](#)
- [All GAFs \(32\)](#)
- [Arg 1 \(15\)](#)
 - [isa \(5\)](#)
 - [BaseKB \(3\)](#)
 - [TransportationVocabularyMt \(2\)](#)
 - [genls \(4\)](#)
 - [disjointWith](#)
 - [comment](#)
 - [genPhrase \(2\)](#)
 - [keClarifyingCollection](#)
 - [evanonymizeExternalConcept](#)

The main content area displays the following information for the "RoadVehicle" collection:

- GAF Arg : 1**
- Mt : BaseKB**
 - [isa](#) : [PublicConstant-DefinitionalGAFsOK](#) [PublicConstant-CommentOK](#) [PublicConstant](#)
- Mt : TransportationVocabularyMt**
 - [isa](#) : [ExistingObjectType](#) [ProductType](#)
 - [genls](#) : [WheeledVehicle](#) [TransportationDevice-Vehicle](#) [LandTransportationDevice](#)
 - [TransportationContainerProduct](#)
- Mt : ProductGVocabularyMt**
 - [disjointWith](#) : [TrainEngine](#)
- Mt : TransportationVocabularyMt**
 - [comment](#) : "A specialization of both [LandTransportationDevice](#) and [TransportationDevice-Vehicle](#). Each instance of [RoadVehicle](#) is a vehicle designed primarily for travel on roads (although some instances may also have limited off-road capabilities). Notable specializations of [RoadVehicle](#) include [Automobile](#), [Truck](#), and [Bus-RoadVehicle](#). Since [RoadVehicle](#) is a specialization of [TransportationDevice-Vehicle](#), each instance of [RoadVehicle](#) is self-powered. Consequently, road transportation devices which are not self-powered (for example, all the instances of [Bicycle](#)) are not included in this collection."
- Mt : EnglishParaphraseMt**

At the bottom of the browser window, the status bar shows "Update Comm: Storing Only Agenda: Sleep KB: 534 System: 1.2277". The taskbar at the very bottom shows several open applications, including "TODO.txt - Notepad", "freshmeat.net: Proje...", "OpenCyc - Microsoft...", "MCCARTHY Cyc KB ...", and "TURING Cyc KB Brow...". The system clock shows "4:52 PM".

Knowledge representation and common sense



Automated Reasoning and Planning

- Game playing
- Planning
- Route finding

A screenshot of a Google Maps browser window showing a route from Claremont, CA to Disneyland. The map displays a blue route through the Los Angeles area. The interface includes search bars, navigation controls, and a list of directions.

Claremont, CA to disneyland - Google Maps - Mozilla Firefox

http://maps.google.com/

christine.alvarado@gmail.com | Saved Locations | Help | My Account | Sign out

Google Maps

Claremont, CA to disneyland

Search the map Find businesses Get directions

Maps

Get reverse directions

From: Claremont, CA 91711

Drive: 27.8 mi (about 35 mins)

1. Head west on W Bonita Ave toward N Indian Hill Blvd 131 ft
2. Turn left at N Indian Hill Blvd 1.0 mi
3. Turn right to merge onto I-10 W via the San Bernardino Fwy/I-10 W ramp to Los Angeles 4.7 mi
4. Take the CA-57 S exit to Santa Ana, 1.1 mi keep following signs
5. Merge onto CA-57 S 18.0 mi
6. Take the Ball Rd exit 3 0.3 mi
7. Turn right at E Ball Rd 2.1 mi
8. Turn left at S Harbor Blvd 0.5 mi

To: Disneyland

Add destination... New!

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Map data ©2007 NAVTEG™

Find: automated Find Next Find Previous Highlight Match case

Transferring data from mt2.google.com...

Perception (vision, graphics)

- Image classification

- ▣ Does the image contain an instance of X?

- ▣ Where is the person's head? What is the person doing?



- Scene segmentation

- Object and face recognition

Robotics

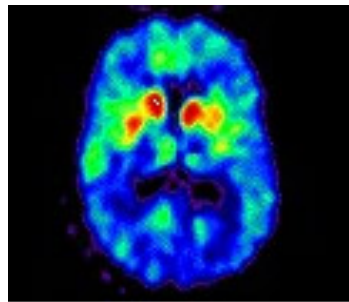


Machine Learning

- A better name would be “Pattern Recognition”
 - Supervised learning – labeled data
 - Unsupervised learning – unlabeled data
 - Reinforcement learning – learning with rewards

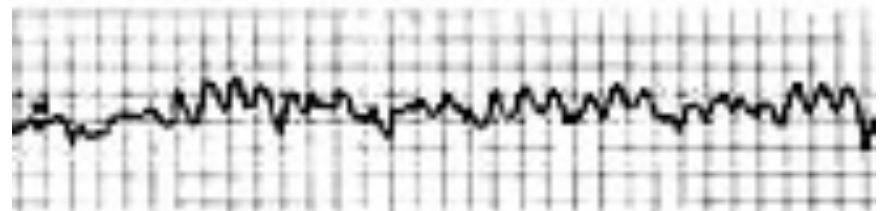


How much land was burned?



Patient have Parkinsons?

Learn a model of western music?



Is this person having a heart attack?

A (short) history of AI

- 1940-1950: Early days
 - 1943: McCulloch&Pitts, boolean circuit of brain
 - 1950: Turing's "Computing machinery and intelligence"
- 1950-1970: "Look, Ma, no hands!"
 - 1950s: Early AI programs including Samuel's checkers program, Newell & Simon's Logic theorist, Gelernter's Geometry Engine
 - 1956: Dartmouth meeting, "Artificial Intelligence" adopted
 - 1965: Robinson's complete algorithm for logical reasoning
- 1970-1990: Knowledge-based approaches
 - 1969-79: Early development of knowledge-based systems
 - 1980-88: Expert systems industry booms
 - 1988-93: Expert systems industry busts, "AI winter"
- 1990: Statistical approaches
 - Resurgence of probability, focus on uncertainty
 - General increase in technical depth
 - Agents and learning systems..."AI spring?"

Reminders



- Reading
 - Skim Chapter 1
 - Get started on next week's reading

- Get yourself ready for the semester
 - Make a link to the course webpage
 - Re-read the syllabus