CS 4700: Foundations of Artificial Intelligence

CS 4701: Practicum in Artificial Intelligence

Fall 2017
Instructor: Prof. Haym Hirsh

Lecture 2
Artificial intelligence will increase productivity by sharpening human mind

The combination of AI and humans will triple productivity if businesses get the balance right for different roles

Research shows that software robots will soon automate 80% of repetitive tasks currently being done by people and increase productivity by freeing up humans to use their brains.
The year of Alexa and the coming decade of A.I.

CES was all abuzz about Alexa and Davos was talking about the impact of the advancements of artificial intelligence.
Artificial intelligence (AI)

Oh the humanity! Poker computer trounces humans in big step for AI

Libratus, an artificial intelligence robot, has won chips worth $1.5m from four of the world’s top poker players in a three-week challenge at a Pittsburgh casino

Every day for the last 20 days, between the hours of 11am and about 10pm, four of the world’s top poker players have been sitting in a Pittsburgh casino, playing against a computer.

Professional poker player Jason Les: 'Libratus turned out to be way better than we imagined. It’s slightly demoralizing.' Photograph: AP
What Jobs Sectors Will Artificial Intelligence Take Over in the Near Future?

01/30/2017 01:14 pm ET

Do you think AI will decrease human labor? originally appeared on Quora: the place to gain and share knowledge, empowering people to learn from others and better understand the world.
Workplace AI makes it all too easy to track you on the job

It helps with security and productivity, but it could also pose a serious privacy risk.

Artificial intelligence can help you work and even help you find work, but it's now being used to monitor you at work... and that's not entirely a good thing. New Scientist notes that a London firm, StatusToday, recently joined a security accelerator run by the UK's GCHQ intelligence agency. The company's AI uses metadata from your workplace habits (such as the files you access and when you unlock doors) to spot unusual behavior as it happens. If you suddenly download a lot of data or venture into a part of the office you never frequent, the AI can alert the company and ask you what's going on.
Artificial Intelligence: Legal, ethical, and policy issues

AI is surrounded by marketing hype, jargon, inflated expectations, and fear. Two experts offer realistic and thoughtful ideas about AI in our society and economy.


Recommended Content:
Training: Data Science and Machine Learning with Python!
If you've got some programming or scripting experience, this course will teach you the techniques used by real data scientists in the tech industry - and prepare you for a move into this hot career path. This comprehensive course includes 68 almost...
Artificial intelligence and the law

Posted Jan 28, 2017 by Jeremy Elman (@miamiip), Abel Castilla

CRUNCH NETWORK

Jeremy Elman
CRUNCH NETWORK CONTRIBUTOR

Jeremy Elman is a partner at DLA Piper, and is head of DLA Piper Miami’s Intellectual Property and Technology and Emerging Growth practices.

Laws govern the conduct of humans, and sometimes the machines that humans use, such as cars. But what happens when those cars become human-like, as in artificial intelligence that can drive cars? Who is responsible for any laws that are violated by the AI?

This article, written by a technologist and a lawyer, explores these questions and more.
Should we be hooking up AI to our brains? New Asilomar principles urge caution

BY ALAN BOYLE on January 30, 2017 at 2:28 pm
Today

• Finish overview of AI
• 4701 course details

Next Time

• Intelligent Agents
• Uninformed Search
1. Ray Solomonoff
2. Marvin Minsky
3. John McCarthy
4. Claude Shannon
5. Trenchard More
6. Nathaniel Rochester
7. Oliver Selfridge
8. Julian Bigelow
9. W. Ross Ashby
10. W.S. McCulloch
11. Abraham Robinson
12. Tom Etter
13. John Nash
14. David Sayre
15. Arthur Samuel
16. Shoulders
17. Shoulder's friend
18. Alex Bernstein
19. Herbert Simon
20. Allen Newell
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1. The Imitation Game.

I propose to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think'. The definitions might be framed so as to reflect as far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words 'machine' and 'think' are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, 'Can machines think?' is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.

The new form of the problem can be described in terms of a game which we call the 'imitation game'. It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman. He knows them by labels X and Y, and at the end of the game he says either 'X is A and Y is B' or 'X is B and Y is A'. The interrogator is allowed to put questions to A and B thus:

C: Will X please tell me the length of his or her hair?
Now suppose X is actually A, then A must answer. It is A's
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### Scholarly Characterization

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## Critiques of AI

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Relationship to Other Disciplines  
(Russell and Norvig, Chapter 1)

• Philosophy:
  • How 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?

• Math:
  • What are the formal rules to draw valid conclusions?
  • What can be computed?
  • How do we reason with uncertain information?
Relationship to Other Disciplines
(Russell and Norvig, Chapter 1)

• Economics:
  • How should we make decisions so as to maximize payoff?
  • How should we do this when others may not go along?
  • How should we do this when the payoff may be far in the future?

• Neuroscience:
  • How do brains process information?

• Psychology:
  • How do humans and animals think and act?
Relationship to Other Disciplines
(Russell and Norvig, Chapter 1)

• Linguistics:
  • How does language relate to thought?

• Control Theory / Cybernetics:
  • How can artifacts operate under their own control?

• Computer Engineering?
  • How can we build an efficient computer?
4700 Course Details

• Instructor: Prof. Haym Hirsh, haym.hirsh@cornell.edu, Gates 352
• TAs: TBA
• Course website: http://www.cs.cornell.edu/courses/cs4700/
  • NOT LIVE YET
• Textbook: Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig, 3rd Edition
• Prerequisites:
  • CS 2110/ENGRD 2110
  • CS 2800 - especially probability, first-order logic
4700 Course Details

• Grade:
  • 14%: Homeworks
    • 3 one-day late “special passes”
    • Use them wisely, no others will come
  • 35%: Prelim (tentatively March 21)
  • 50%: Final
  • 1%: Course evaluation
• Extra credit (used if you are borderline between two grades):
  • Class participation
  • Piazza participation
  • Special lectures
  • Something spectacular on a homework
  • ...
4700 Course Details

• Laptop policy:
  • Can use if it’s about what’s being discussed

• Collaboration policy:
  • You can discuss homework with others, but you must write up your homework on your own
  • (“Gilligan’s Island” policy)
  • You will not do well on the exams if you cannot do the homeworks on your own
Intelligent Agents
(R&N Chapter 2)

How do you formulate a problem in AI so that you can approach it computationally?
Intelligent Agents
(R&N Chapter 2)
Intelligent Agents
(R&N Chapter 2)
Intelligent Agents
(R&N Chapter 2)

• An “agent”:
  • Perceives its environment through **sensors**
    • What it currently senses is its “percepts”
    • The history of its senses is its “percept sequence”
  • Acts on its environment through **actuators**
    • Actuators are what cause the agent’s “actions”
  • The box with the question mark is the agent’s **action function**
    • F(percepts) → actions
Intelligent Agents
(R&N Chapter 2)

• A “rational agent”:
  • “Does the right thing” given some **performance measure**
  • For every possible percept sequence, a rational agent should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has.

• Depends on:
  • A performance measure that defines the criterion of success
  • The agent’s prior knowledge of the environment
  • The actions that the agent can perform
  • The agent’s percept sequence to date
Intelligent Agents
(R&N Chapter 2)

• Properties of task environments:
  • Fully observable or partially observable
  • Single or multi-agent (competitive vs cooperative)
  • Deterministic vs stochastic
  • Episodic vs sequential
  • Static vs dynamic
  • Discrete vs continuous
  • Known or unknown
  • How do agents represent the environment: Atomic vs factored vs structured
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CS 4701: Practicum in Artificial Intelligence

Fall 2017
Instructor: Prof. Haym Hirsh
CS 4700: Foundations of Artificial Intelligence

CS 4701: Practicum in Artificial Intelligence

Fall 2017
Instructor: Prof. Haym Hirsh
4701 Course Details

• Grade:
  • No lectures
    • Occasional appearances in 4700
  • 2 assignments
    • 50% each
    • One due half-way through the semester
    • One due at end of semester
• Work in teams of 2
  • Other sizes possible with permission
  • Strongly advise against it
  • Grade is proportional to workload
4701 Course Details

• Grade:
  • No lectures
    • Occasional appearances in 4700
  • 2 assignments
    • 50% each
    • One due half-way through the semester (game playing)
    • One due at end of semester (?)
• Work in teams of 2
  • Other sizes possible with permission
  • Strongly advise against it
  • Grade is proportional to workload
• Programming language doesn’t matter
• Quality of code doesn’t matter