

Lecture I: Introduction

CSSE 5600/6600: Artificial Intelligence

Instructor: Bo Liu

Course objectives

- ◆ Understand, analyze & experiment with basic AI algorithms and techniques
- ◆ Learn how to apply AI techniques in non-AI settings
- ◆ Learn how to evaluate AI-related technology claims
- ◆ Prepare for specialized AI courses and research

Basic information

- Instructor: Professor Bo Liu (boliu@auburn.edu)
- Time: 2:00-3:15 on Tuesday/Thursday
- Email: boliu@auburn.edu
- TA: Daoming Lyu (dzl0053@tigermail.auburn.edu)
- Lecturer Office Hour: TR 3:30 - 4:30 pm Shelby 3101P
- TA Office Hour: TR 10:30am - 12:00 pm
- Lecturer and TA Office Hour start from the 2nd week

Course information

- Reading and class participation
- Programming assignments
- Grading: Homework (50%), Midterm exam I & II (30%), Final project (20%), **Class involvement bonus (5%)**
- Textbook: “Artificial Intelligence: A Modern Approach,” (3rd Edition) Stuart Russell and Peter Norvig, Prentice Hall, 2003.
- Additional readings (required vs. optional)
- All the class materials are on Canvas

Tentative schedule

- **Introduction (1)**
- **Problem solving using search (4)**
- **Machine Learning (8)**
- **Planning & learning (8)**
- **Reasoning under uncertainty (3)**
- **Deep learning (2)**
- **Case study: DeepMind AlphaGo (1)**
- **Summary (1)**

Content

- **What is AI? Why is it hard? What can it do?**
- **AI milestones**
- **An agent-centric view of AI**
- **Course information**

Can computers think?

“The question of whether a computer can think is no more interesting than the question of whether a submarine can swim.”

— Edsger Dijkstra

- ❖ Can submarines swim?
- ❖ Can airplanes fly?

What is AI?

Historical definition of artificial intelligence:

“The study of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.”

Dartmouth Workshop, Summer of 1956

- ❖ Is this conjecture settled?
- ❖ Is this a reasonable definition of modern AI?

Modern AI has multiple goals

- ◆ Constructing intelligent machines for a wide range of applications
- ◆ Formalizing knowledge and mechanizing intelligence
- ◆ Using computational models to understand complex behavior
- ◆ Making computers as easy to work with as people

Why is AI so hard?

- ◆ Many building blocks are themselves AI-complete:
Vision, robotics, natural language understanding
- ◆ Ambiguity:
“Milk drinkers are turning to powder”
- ◆ Computational intractability:
“Is there a winning opening move in chess?”
- ◆ Conflicting goals and tradeoffs:
“Find a good R/T airfare to San Francisco.”
- ◆ Reasoning under uncertainty:
Missing information, probabilistic actions, open
and dynamic environments.

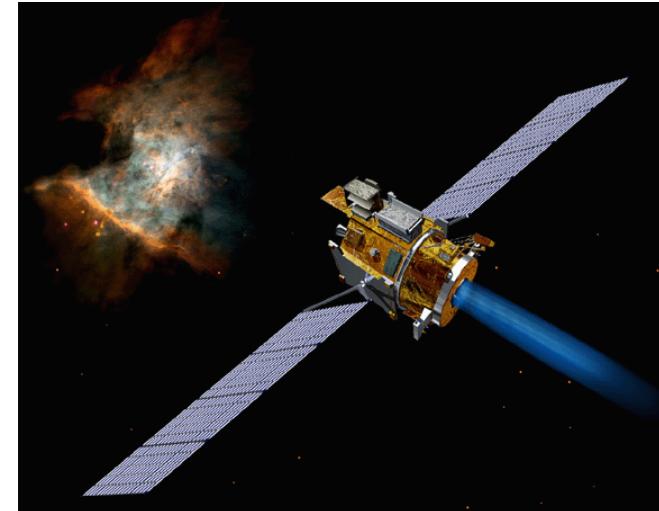
Example: counting chairs



What can AI systems do today?

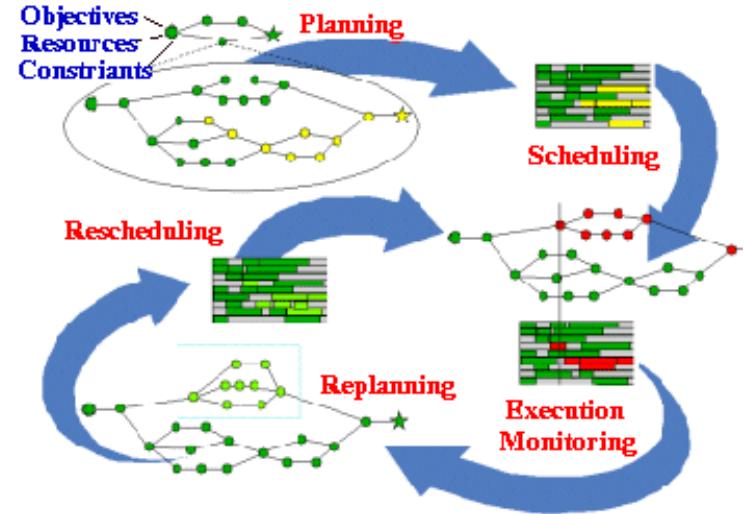
- ◆ Playing a decent game of ping-pong?
- ◆ Driving in the center of Cairo?
- ◆ Buying a week's worth of groceries at the market?
- ◆ Buying a week's work of groceries on the web?
- ◆ Playing a decent game of bridge at a competitive level?
- ◆ Discovering and proving new mathematical theorems?
- ◆ Writing an intentionally funny story?
- ◆ Drawing an artistically interesting picture?
- ◆ Giving competent legal advice in specialized areas?
- ◆ Translating spoken English into spoken Swedish in real time?
- ◆ Performing a complex surgical operation?
- ◆ See also <http://aitopics.net>

Space exploration



- ➊ In May 1999, Remote Agent was given primary control of NASA's Deep Space 1 spacecraft. For two days it controlled the operation of the spacecraft more than 60,000,000 miles from Earth.
- ➋ <http://ti.arc.nasa.gov/tech/asr/planning-and-scheduling/remote-agent/>

Logistics planning



- ➊ DARPA's DART system used in Desert Storm and Desert Shield operations to plan logistics of people and supplies. Reduced planning times from weeks to just a few hours.
- ➋ DARPA claimed more savings from the use of the system than was ever invested in the research.
- ➌ [https://en.wikipedia.org/wiki/
Dynamic_Analysis_and_Replanning_Tool](https://en.wikipedia.org/wiki/Dynamic_Analysis_and_Replanning_Tool)

NLP

La BO Liu

Assistant

Service de la technologie de l'informatique et de la programmation

Université auburn

Email :

boliu à l'edu auburn de POINT

- ➊ Machine Translation: Lots of progress. See Google's or bing's translation tools.
- ➋ One early system translated the English sentence “The spirit is willing but the flesh is weak” into the Russian equivalent of “The vodka is good but the meat is rotten.”
- ➌ http://www.google.com/language_tools
<http://www.bing.com/translator/>

Speech + NLP



- ➊ Siri is an intelligent personal assistant that works as an application for Apple's iOS. It uses a natural language user interface to answer questions, make recommendations, and perform actions by delegating requests to a set of Web services.
- ➋ <http://www.apple.com/ios/siri/>

Autonomous driving



- An autonomous vehicle named STANLEY sped through the rough terrain of the Mojave dessert at 22 mph, finishing the 12-mile course first to win the 2005 DARPA Grand Challenge.
- The following year, CMU's BOSS won the Urban Challenge, safely driving in traffic while obeying traffic rules and avoiding pedestrians and other vehicles.
- <http://www-cs.stanford.edu/group/roadrunner/stanley.html>

TAG California DMV , driverless cars

California DMV to Google self-driving car: Go, get a steering wheel

By **Nicole Arce**, Tech Times | August 24, 2:05 AM

 SHARE(11)

 TWEET(12)

 0 COMMENTS



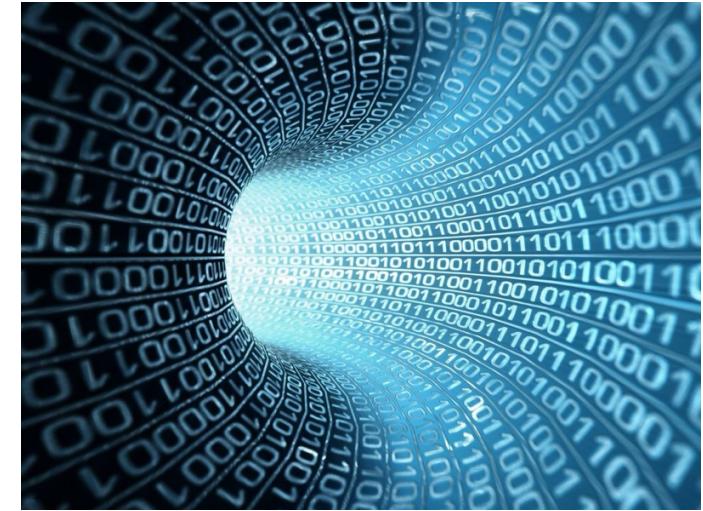
While Google is rushing onwards to its vision of a driverless car of the future, the California DMV isn't in the same hurry and issues new rules requiring Google to add a steering wheel to its self-driving car.

(Photo : Google)

Google's self-driving cars are ready to hit the public roads for testing, but California's Department of Motor Vehicles (DMV) has thrown a speed bump in the form of new rules that require the driverless cars to have a steering wheel and brake pedals.

The new [rules](#) (pdf) issued by the DMV require the car's driver to have "immediate physical control of the vehicle or (be) actively monitoring the vehicle's operations and capable of taking over" and will take effect on September 16.

Big data



Data

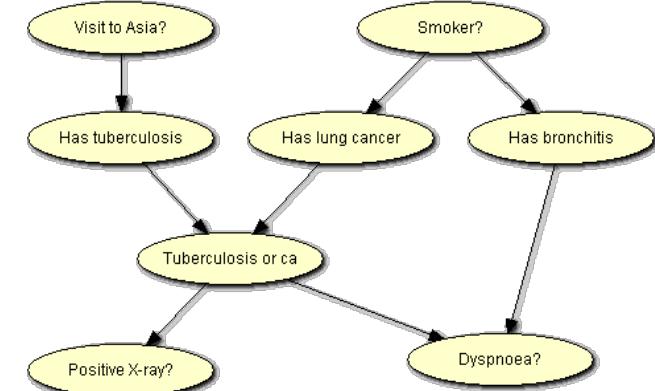
~~Knowledge~~ is Power

— Sir Francis Bacon, 1597

— Ed Feigenbaum, 1968

- ➊ Many applications: preference elicitation; spam filtering; fraud detection and transaction approval; prediction of daily revenues and staffing requirements; social media analysis
- ➋ Big challenge: inferring and reasoning about causality rather than mutual information

Medical diagnosis



- Pathfinder is a medical diagnosis expert system developed at Stanford in the 1980's for lymph-node diseases. It deals with over 60 diseases and 100 findings and outperforms the experts who were consulted during its creation. The system has been approved by the AMA and commercialized by Intellipath.
- One of the first applications of belief networks

[Home](#) | [U.K. Home](#) | [News](#) | [Sport](#) | [U.S. Showbiz](#) | [Femail](#) | [Health](#) | **Science** | [Money](#) | [RightMinds](#) | [Travel](#) | [Columnists](#)[Science Home](#) | [Pictures](#) | [Gadgets Gifts and Toys Store](#)[Login](#)

The gameshow winning supercomputer that couldn't stop saying 'bull****': IBM forced to wipe hard drive after machine downloaded an urban dictionary

- Artificial intelligence machine Watson began swearing after memorising the contents of the Urban Dictionary
- It was fed the repository of colloquial English in a bid to equip it with the knowledge to pass the Turing test of computer intelligence
- But researchers were forced to wipe the dictionary from the machine's memory after it started giving backchat to researchers

By [DAMIEN GAYLE](#)

PUBLISHED: 10:32 EST, 11 January 2013 | UPDATED: 07:59 EST, 12 January 2013

[Comments \(98\)](#) | [Share](#) 51 | [Tweet](#) 222 | [Like](#) 2.8k

An IBM supercomputer had to have its memory wiped because its programmers could find no other way to stop him swearing.

Artificial intelligence Watson, which famously won Jeopardy! against the game show's human champions, kept making obscene outbursts after memorising the contents of the [Urban Dictionary](#).

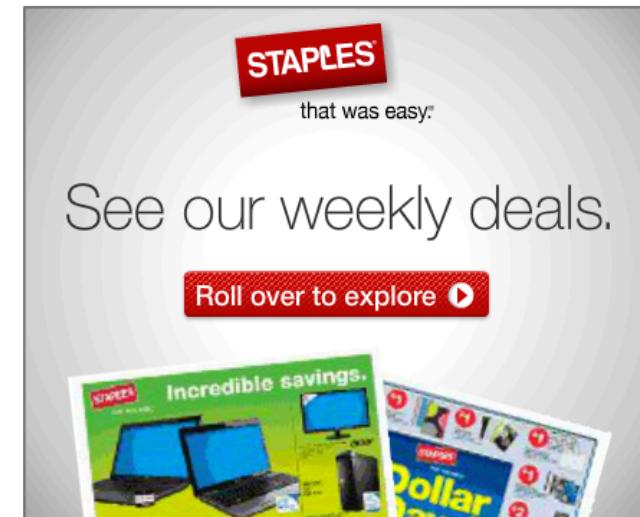
The website is a repository of English-language slang, and inevitably includes a range of profanities and insults completely inappropriate for polite conversation.

 Site Web

STAPLES
that was easy.

See our weekly deals.

[Roll over to explore](#)



Today's headlines

Most Read

- ▶ The TV so big you have to keep it outside: World's largest set boasts a 201inch screen and costs £414,000
- ▶ The first Kindle? The amazing mechanical book reader from 1935 (although you wouldn't want to take it on the train)
- ▶ Is the iPhone losing its appeal? Apple forced to cut component orders amid low demand for latest handset
- ▶ Look no hands! Our man on the Las Vegas highway is the first to road-test the car that drives - and parks

Mobile robot navigation in unknown environments



- In August 2008, the robot ACE went autonomously from the TUM lab to Marienplatz in Munich. It did so without any map or GPS, finding its way solely using information from passers-by.
- <http://www.ace-robot.de/>
- Winner of the IJCAI-09 AI Video Competition “most innovative video” award

Fulfillment Systems



- ➊ Kiva Systems introduced a new approach to automate fulfillment centers using mobile robots
- ➋ Goods are stored on “pods” that are brought to packing stations automatically
- ➌ Each mobile robot can slide under a pod, lift it and deliver it to the packing station
- ➍ The robots are battery powered and charge for five minutes every hour.
- ➎ Company bought by Amazon in 2012 for \$775 million

Content

- What is AI? Why is it hard? What can it do?
- **AI milestones**
- An agent-centric view of AI
- Course information