Welcome to

CS440 / ECE 448 Introduction to Artificial Intelligence

Prof. Julia Hockenmaier

Lecture 1: Introduction

CS440/ECE448
Introduction to Artificial Intelligence

Prof. Julia Hockenmaier

Welcome to CS440!

Prof. **Julia Hockenmaier**
juliahmr@illinois.edu
Office hours: Thursdays, 2-3pm, SC3324

TA: **Yonatan Bisk**
Office hours: Wednesdays, 11am-1pm
Office: SC0207

TA: **Parisa Haghani**
Office hours: Mondays, 1-3pm
Office: SC027

Emailing us:
cs440help-sp11@cs.illinois.edu

Today's lecture

- What is Artificial Intelligence?
- How will we teach this class?
  What will you learn in this class?
- What will we expect of you?

What is Artificial Intelligence?

What is AI?

Logicians:

- Can we *define* 'the laws of thought'?

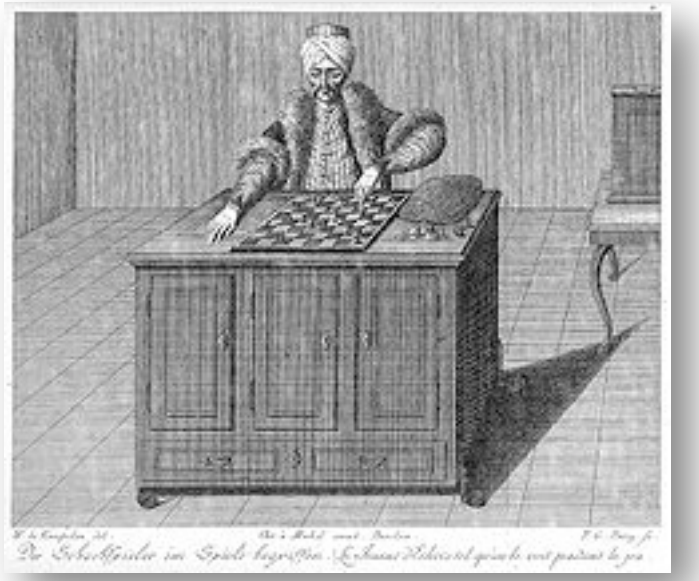
  (Ancient Greece, also India, China)
- Can we *automate* the laws of thought?

  (since the Industrial Revolution)

Today: automated theorem provers used in math, industry (software/hardware verification), etc.

What is AI?

Mechanical Turk (1770):
'Automatic' **chess** player
(highly influential hoax)



What is more difficult:
to get a machine to play
chess, or to weave cloth?

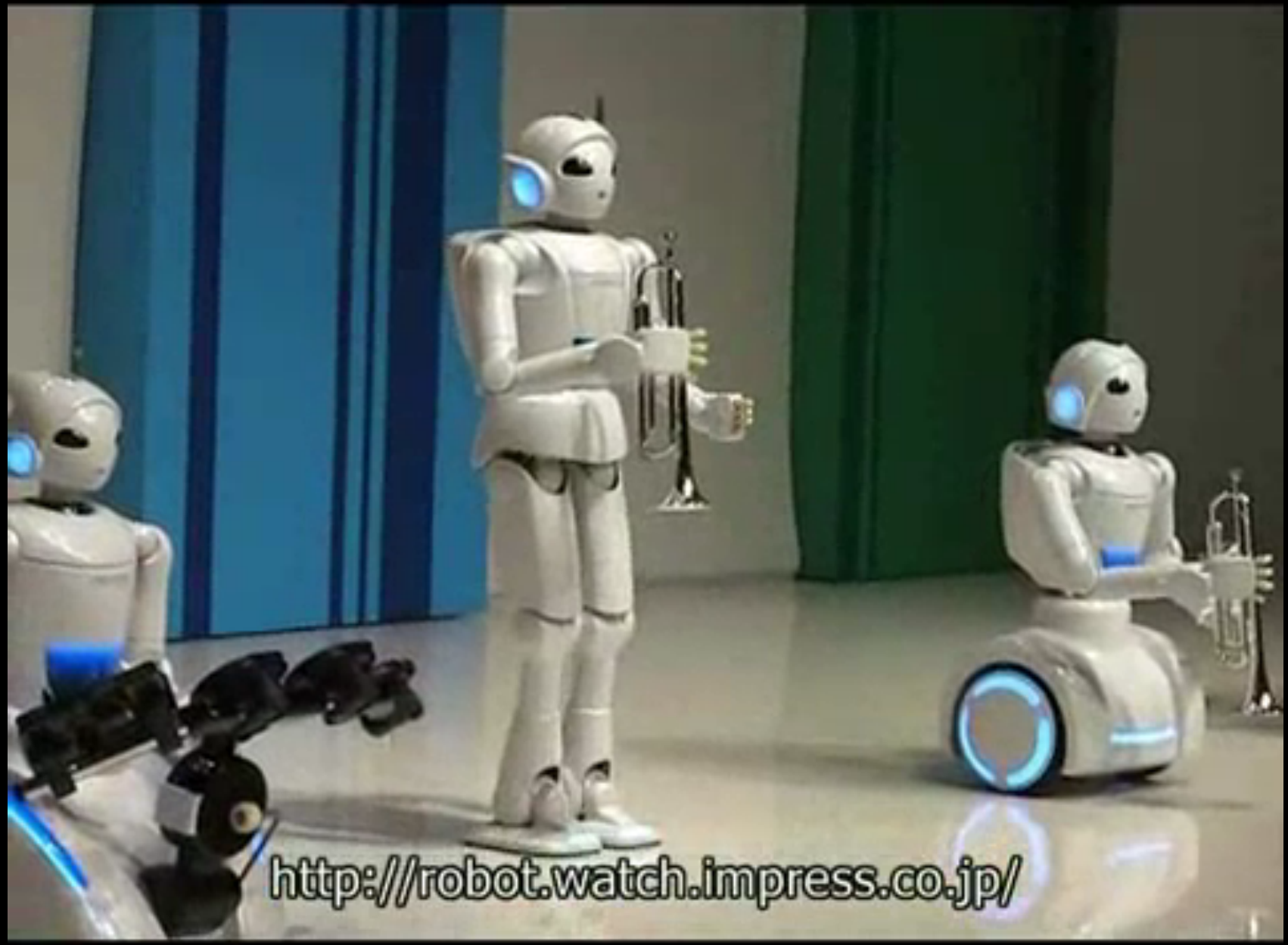
Today: IBM's DeepBlue beat Kasparov in 1997, and my phone beats me in 2010

What is AI?

Vaucanson's **automata** (1730s):

- flute player
- tambourine player

Today: Toyota's violin-playing robots and robot jazz band; improvising Marimba-playing robot (Georgia Tech)


http://robot.watch.impress.co.jp/

What is AI?

The Turing test: (Alan Turing, 1950)
Human-like **conversation skills** as test whether machines can think.
(http://loebner.net/Prizef/TuringArticle.html)

Today:
Chatbots/automated helplines are common; IBM's Watson can beat human experts on Jeopardy! (2011) (http://www.ibmwatson.com)

What is AI?

Photo: Jason Sewell , on flickr.com

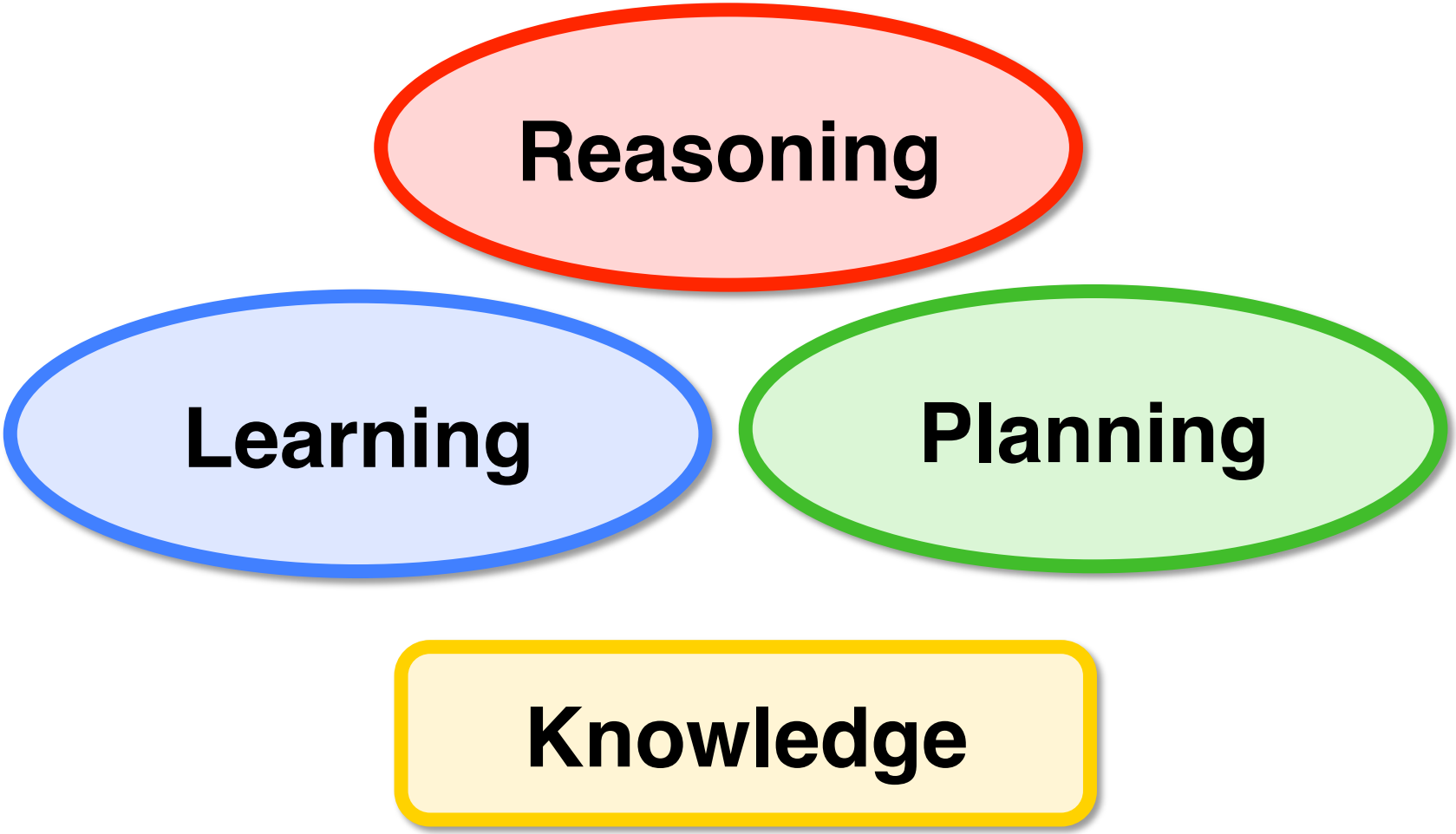
What is AI?

Vacuum-cleaning robots (Roomba)

NASA's Mars exploration rovers

Autonomous vehicles
(EUREKA's Prometheus Project, DARPA's Grand Challenge, Google's Driverless car)

What is intelligence?



AI as engineering

How can we design an “intelligent” **agent** to solve a specific **task** in a particular **environment**?

Agent: just software or physical (robot)

Examples of AI tasks

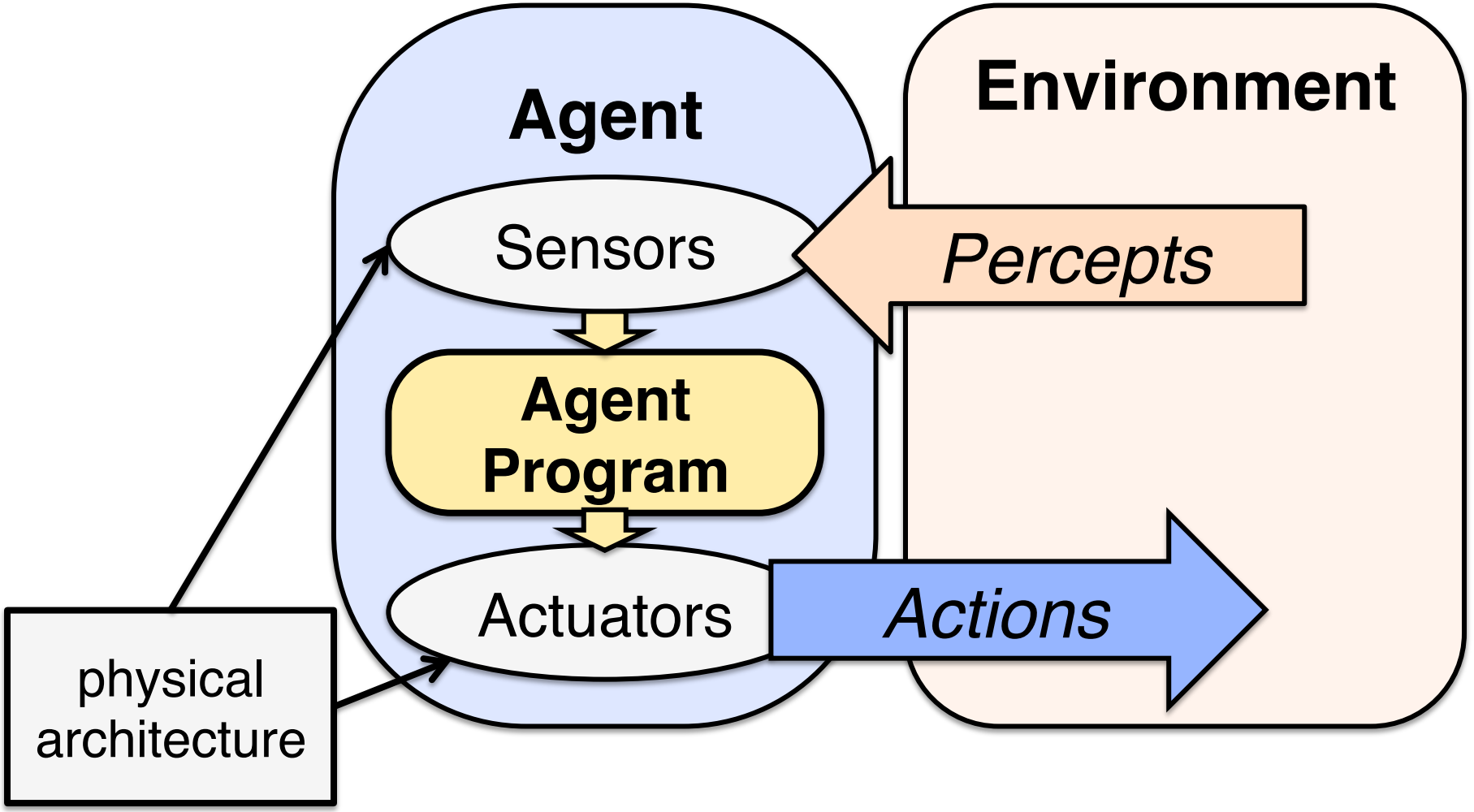
Reasoning:
Solve sudoku; play a game of chess

Robotics:
Move towards a goal, avoiding obstacles

Natural language processing:
Understand/produce sentences

Computer vision:
Recognize faces in an image

Agents operate in an environment



What is reasoning?

- Making a **decision**
- Drawing a **conclusion**
- Choosing an **action**
- Developing an **interpretation**

Reasoning requires **inference**.
Following a reflex is not reasoning.

Reasoning requires models

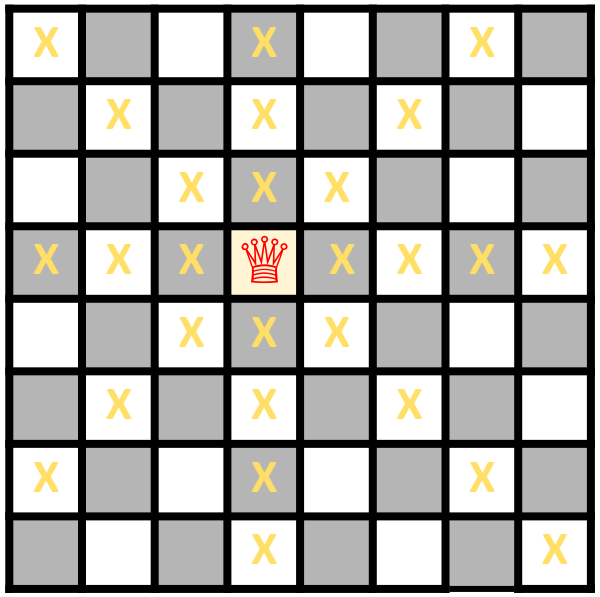
Sensors provide agents with **raw signals**.

In order to “make sense” of these signals, agents need to **interpret** them.

This requires a **model**, i.e. an **internal representation** of the world

Models are abstractions

1. e4 e5
2. Qh5 Nc6
3. Bc4 Nf6
4. Qxf7# 1–0



The physical world is continuous.

It is often easier to reason with **(discrete) abstractions** of the world.

Areas of AI

- Reasoning/problem solving
- Knowledge representation
- Machine learning
- Planning
- Computer perception (vision, audio/speech)
- Natural language processing
- Robotics

How will we teach this class?

The purpose of this class

Understand the **foundations** of AI
(in breadth, rather than depth)

Some overlap with classes in machine learning, automated reasoning

This is *not* a class in applications, i.e.:

- robotics
- computer vision
- natural language processing

Syllabus

Searching/Planning

(Solving puzzles, finding goals)

Reasoning

(Logic, probabilistic reasoning)

Learning

(Statistical learning, classification)

CS440 consists of…

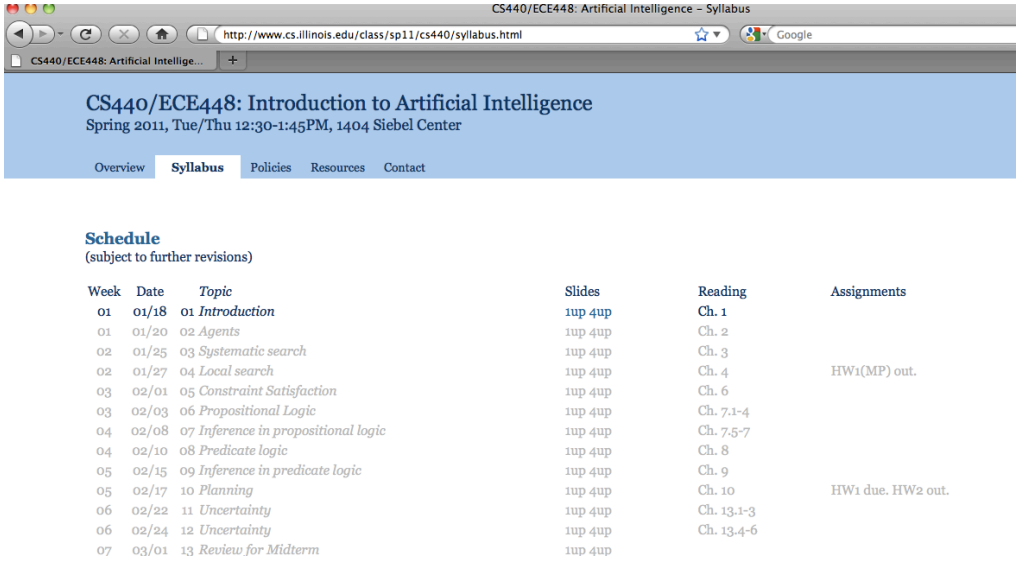
- **Lectures:** Tue/Thu 12:30-1:45 Siebel 1404
- **Office hours:**
  - **Prof. Hockenmaier** Thu 2pm Siebel 3324
  - **Yonatan Bisk** Wed, 11am-1pm Siebel 0207
  - **Parisa Haghani** Mon, 1pm-3pm Siebel 0207
- **Website:** http://cs.illinois.edu/class/cs440
- **Compass site:** https://compass.illinois.edu
- **Newsgroup:** http://news.illinois.edu
- **Textbook**

Website

http://cs.illinois.edu/cs440

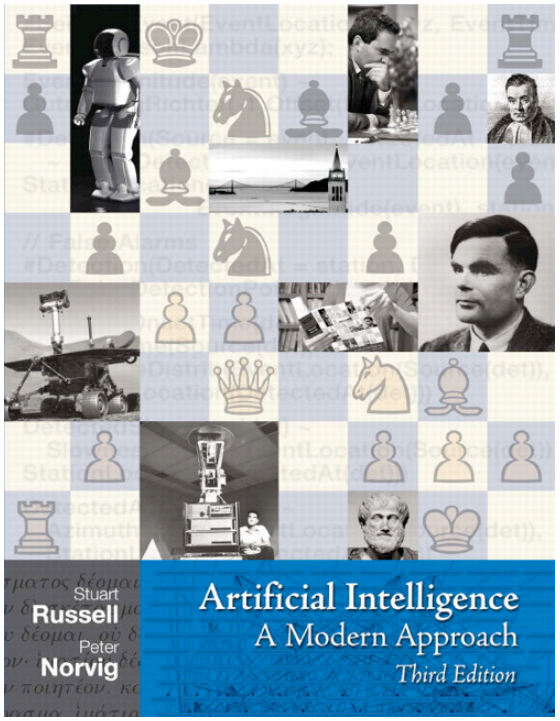
The website contains:

- **Syllabus**:
  topics, readings
- **Lecture slides**
- **Course policies**
- **Contact info**



Textbook

Russell & Norvig
Artificial Intelligence:
A Modern Approach
3rd edition (blue)



Available locally at bookstore and on reserve at Grainger

Required reading & reference

Additional materials at http://aima.cs.berkeley.edu/

Assessment (3 hours credit)

- **25% Quizzes** on Compass:
  - **What:** one after each lecture, up to 1% credit for each
  - **Why:** to make sure you review the class material

- **15% Assignments:**
  - **What:** 2 written, 2 programming (MPs)
  - **Why:** to make sure you can apply the class material

- **30% Midterm exam** (Thu March 03, during class)
- **30% Final exam** (Fri May 13, 7pm)
  - **What:** closed-book exam
  - **Why:** to make sure you understand the material

Assessment (4th hour credit)

4th credit hour: a **research project**
or a literature survey

The research project needs to have a significant programming and writing component.

Topic and scope needs to be discussed with us in advance.

So:

- **75% of your grade** will be determined as if you took the class for 3 credit hours
- **25% of your grade** will be determined by how well you do on your research project

Assignments

- We post and you submit via Compass
- **Written assignments:**
  - We will not accept handwritten solutions.
  - We only accept PDFs
- **Machine problems:**
  - You need to submit executable source code and sufficient documentation for us to understand and run it without too much effort.
- We aim to post solutions to written assignments three days after due date

Assignments: late policy

- You have a total of 72 hours of ‘late credit’ that you can use for across the entire semester.
- Once you have run out of ‘late credit’, you will be penalized by 20% per late day
- We will not accept solutions more than four days after the due date
- We will make exceptions if you can prove you’ve had an emergency or illness outside of your own control

5% extra credit opportunity

We will announce special **problem-set office hours.** Yonatan and Parisa will work with you through exercises from the textbook.

You get 1% extra credit for each different problem-set office hour you actively participate in, up to 5% total.

NB: this is good preparation for the exam!

What will we expect of you?

Participate…

… come to class!
… re-read the lecture slides!

… read (the relevant parts of) the textbook!

… attend office hours!

… tell us if you don't understand something

… check the Compass site,
the newsgroup, and the website

Your tasks for today

1. **Log on to the Compass site**
   http://compass.illinois.edu
   Do the first (ungraded) quiz *within the next 36 hours (before 2am Thursday)*
2. **Go to the class website**
   http://cs.illinois.edu/class/cs440
   1. Read the grading policies
   2. Mark the midterm grade in your calendar
   3. Bookmark the site!
3. **Log on to the newsgroup.**