

CS343
Introduction to Artificial Intelligence
Spring 2010

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The University of Texas at Austin

Good Afternoon, Colleagues

Welcome to a **fun**, but
challenging course.

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Goal

- Learn about **Artificial Intelligence**

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 - Increase your **AI Literacy**
 - Prepare you for **Topics Courses** and/or **Research**

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- Learn about **Artificial Intelligence**
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- **Breadth** over **Depth**

Definition

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Textbook: Autonomous Agents

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- No generally accepted definition

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- I know one when I see one...

Definition

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Textbook: Autonomous Agents

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- I know one when I see one...
- ... By the end of this course, so will you

Science and Engineering

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 - What is a mind?

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 - Can we build a mind?

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 - Can we build a mind?
 - Can trying to build one teach us what a mind is?

Today

1. An introduction to **What AI can Do**
2. A walk through the **syllabus**

A Goal of AI

Robust, **fully autonomous**
agents in the real world

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How?

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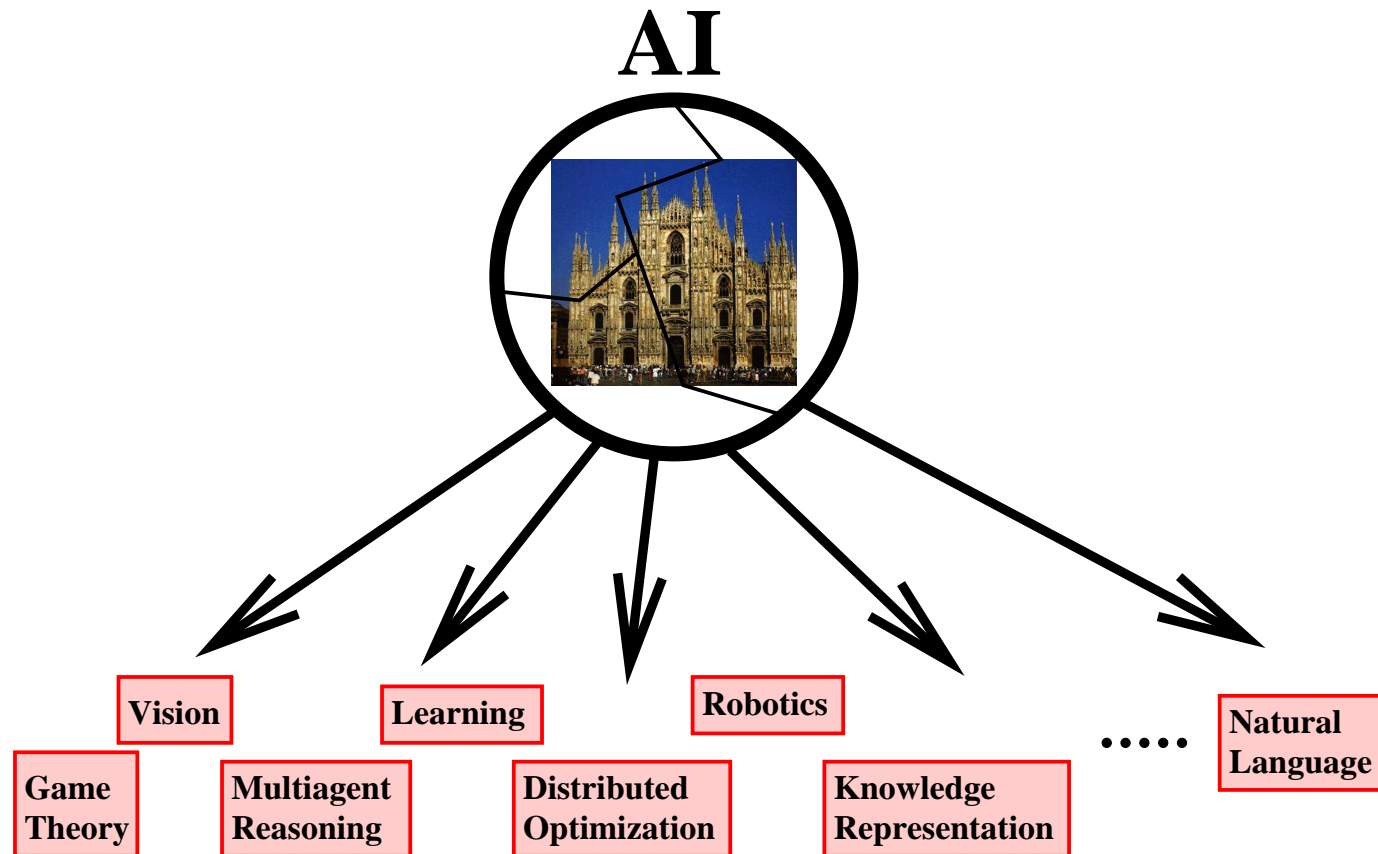
How?

Bottom-Up Metaphor

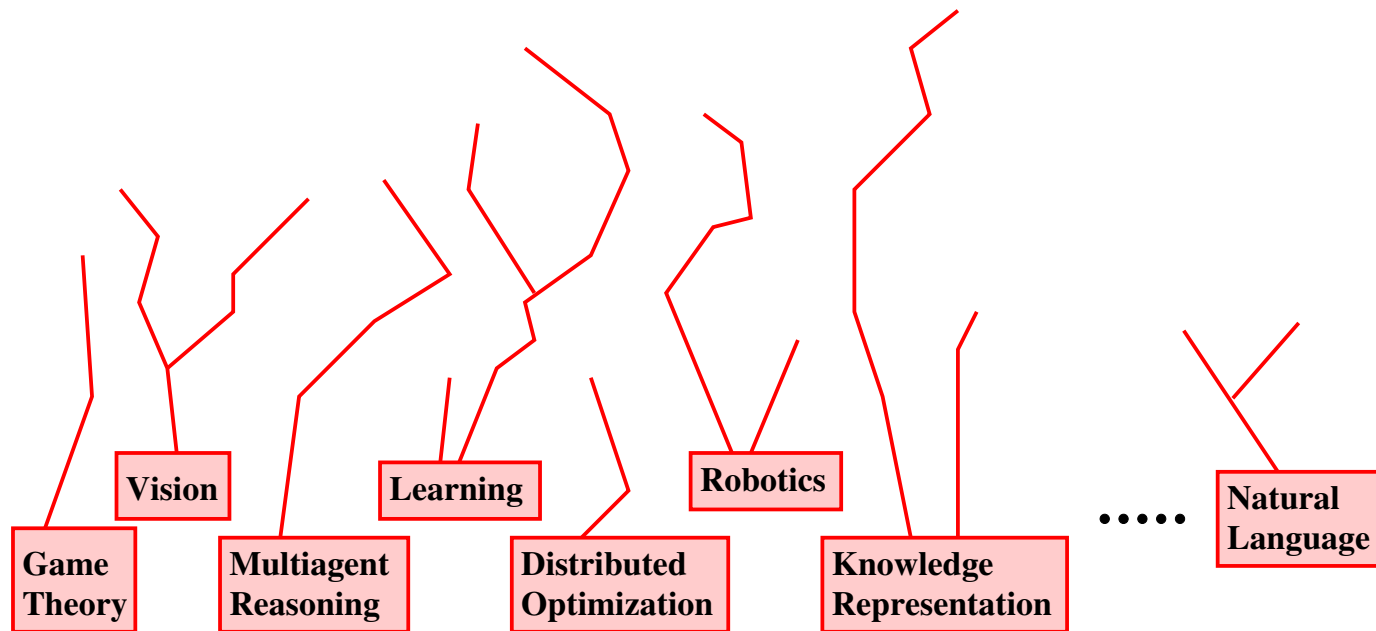
Russell, '95

“Theoreticians can produce the AI equivalent of bricks, beams, and mortar with which AI architects can build the equivalent of cathedrals.”

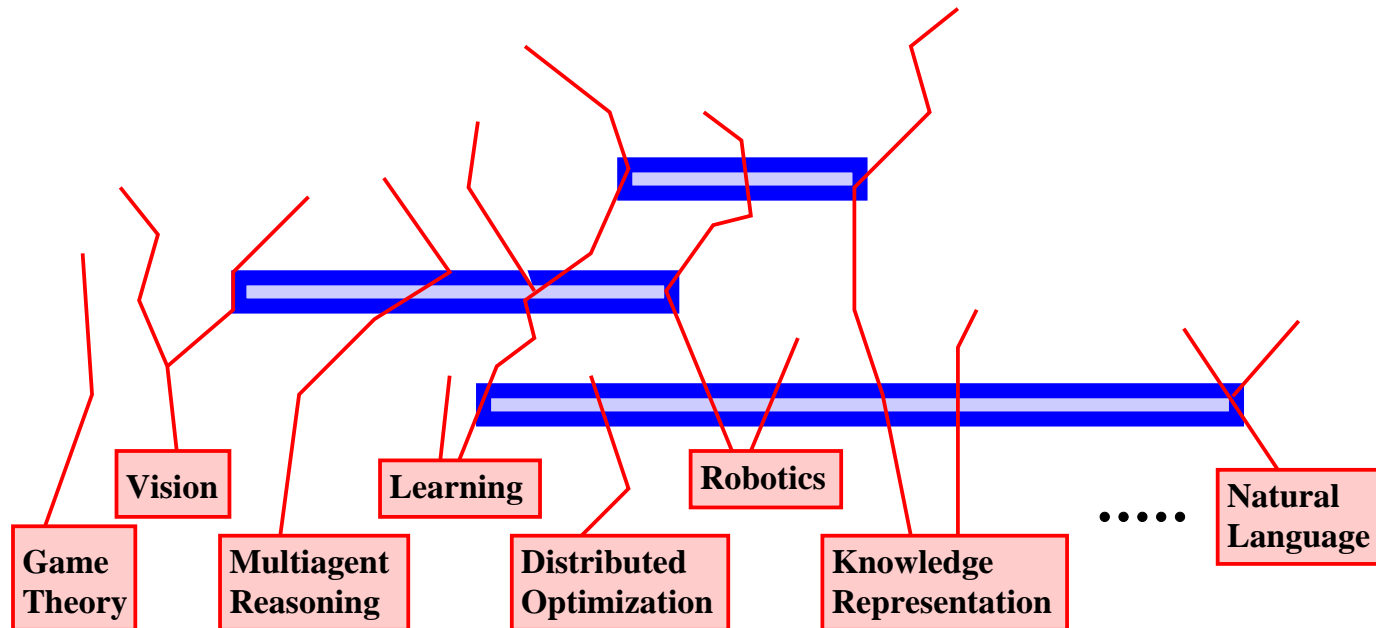
Dividing the Problem



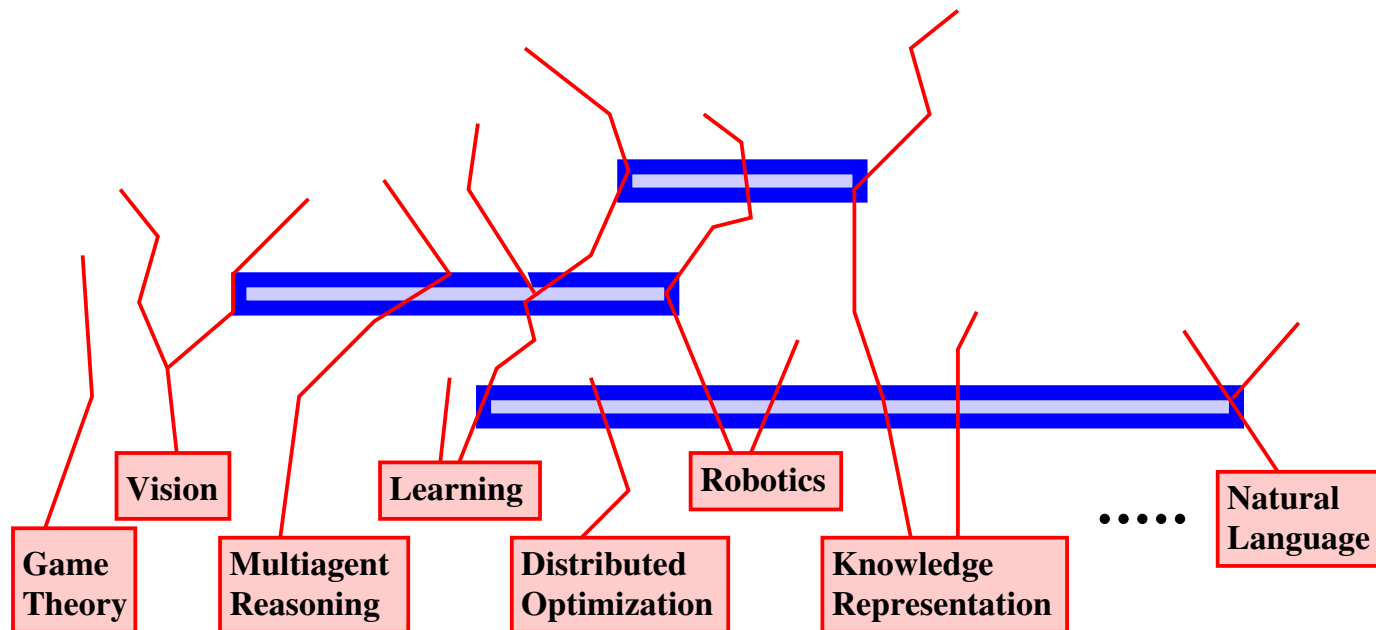
The Bricks



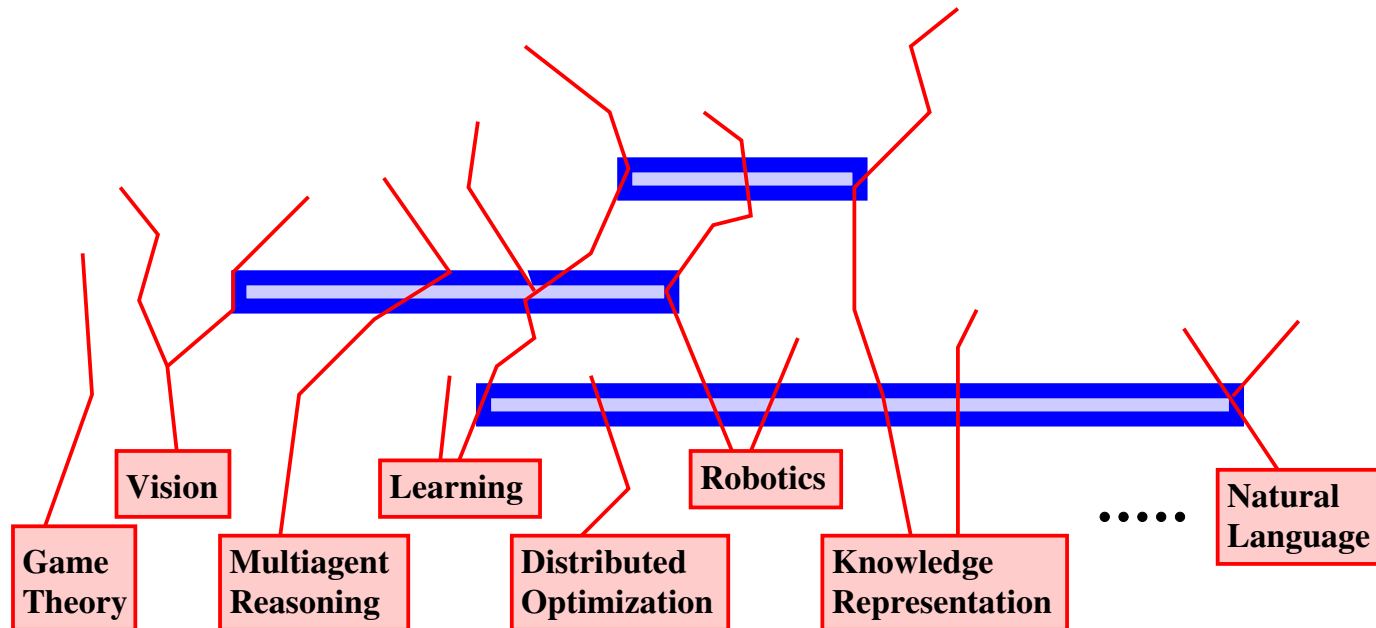
The Beams and Mortar



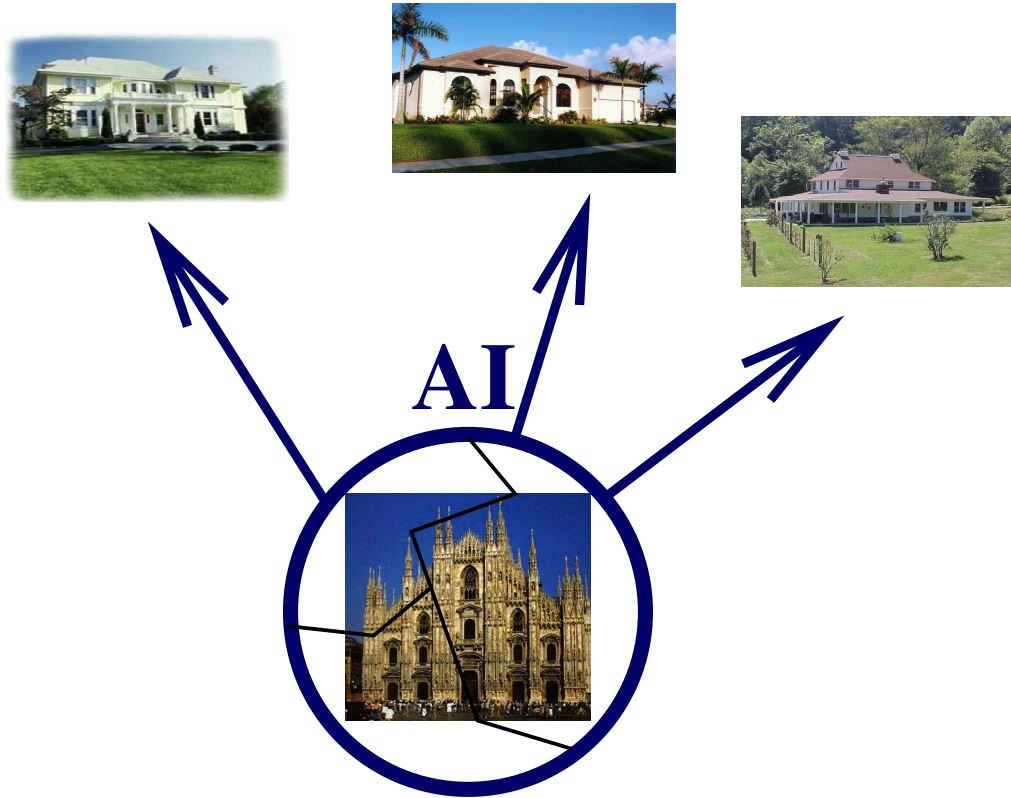
Towards a Cathedral?



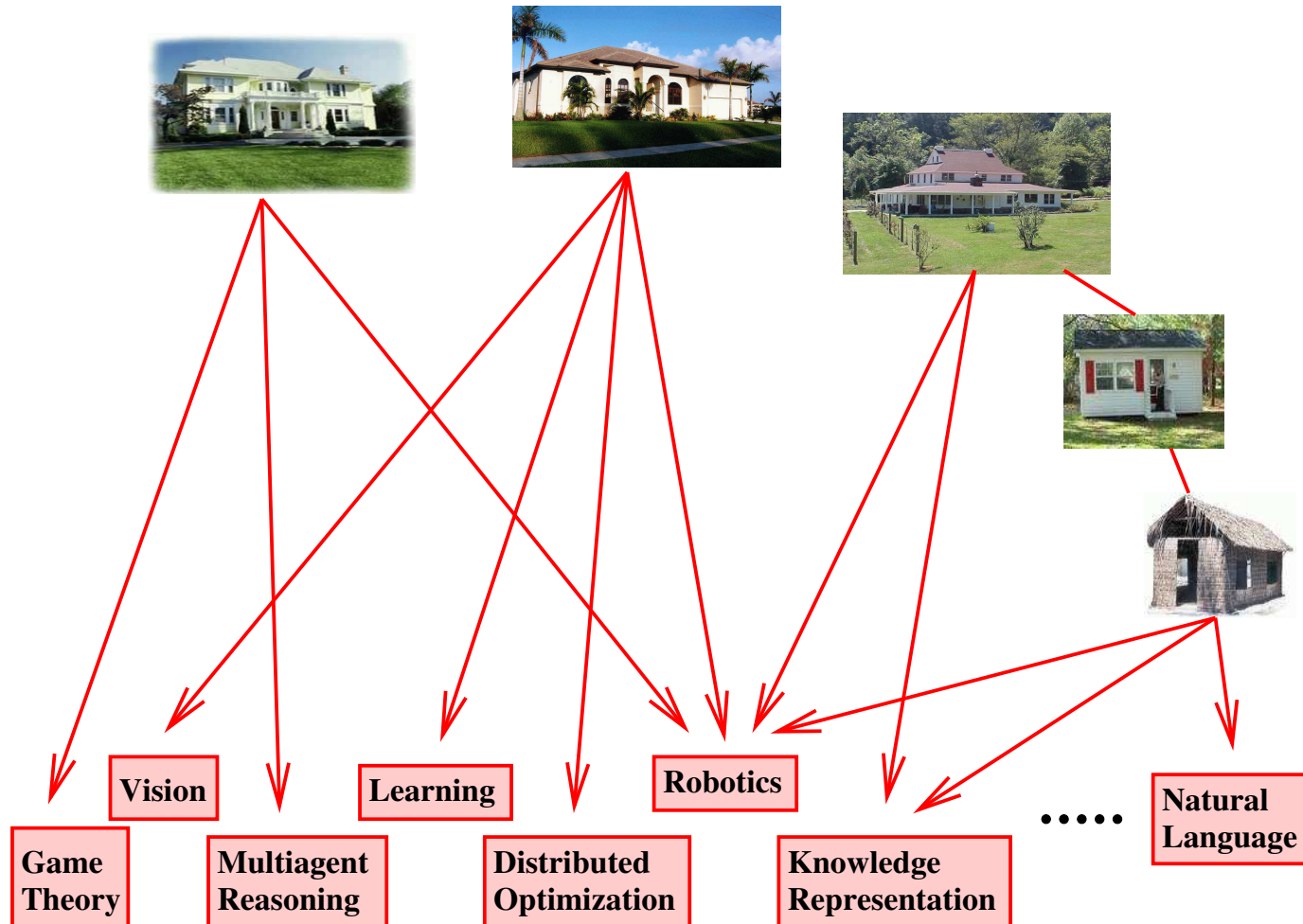
Or Something Else?



A Different Problem Division

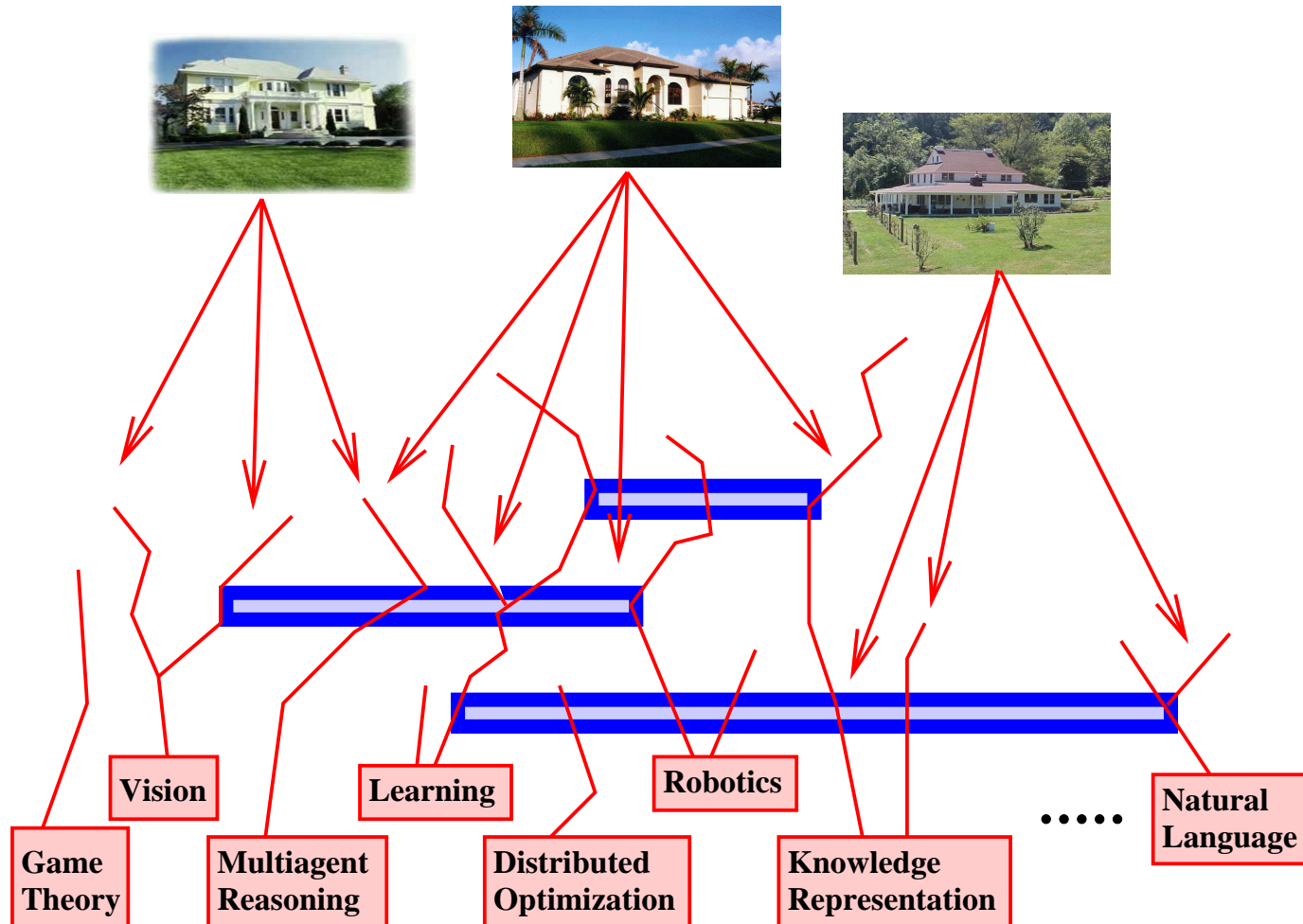


Top-Down Approach



“Good problems . . . produce good science” [Cohen, '04]

Meeting in the Middle



Good Problems Produce Good Science

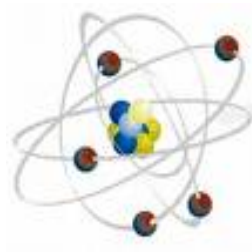
Manned flight



Apollo mission



Manhattan project



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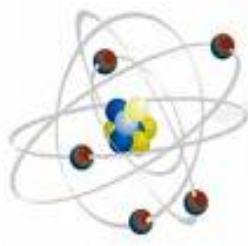
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RoboCup soccer



Goal: By the year 2050, a team of humanoid robots that can beat the human World Cup champion team.

[Kitano, '97]

RoboCup Soccer

- Still in the early stages
- Many virtues:
 - Incremental challenges, closed loop at each stage
 - Relatively easy entry
 - Multiple robots possible
 - Inspiring to many
- Visible progress



Small-sized League



Middle-sized League



Legged Robot League



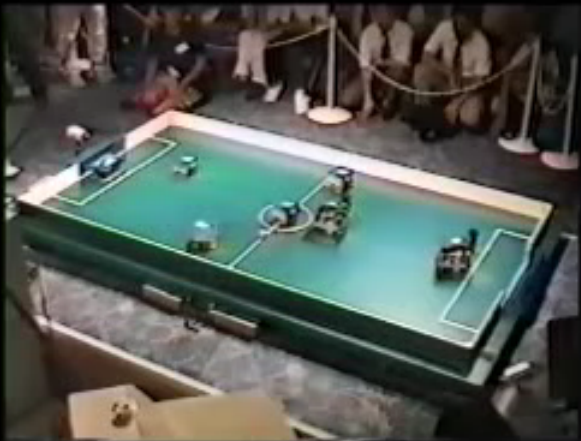
Simulation League



Humanoid League

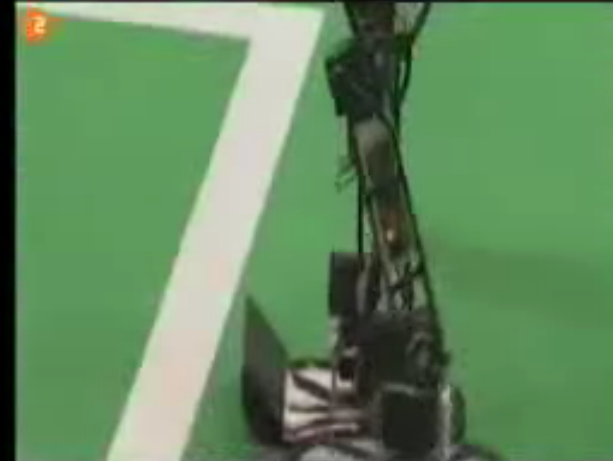
The Early Years

RoboCup 1997-1998



A Decade Later

RoboCup 2005–2006

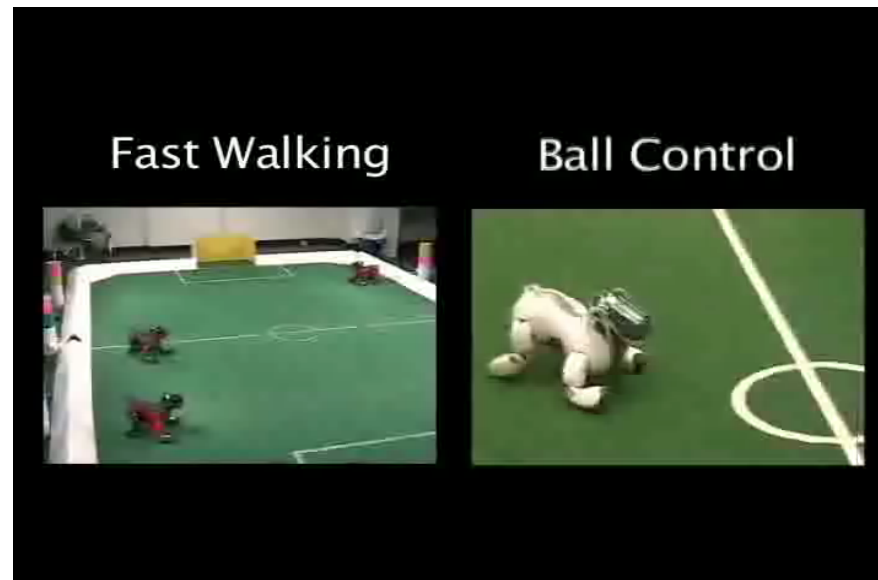


Learning in RoboCup


1999 Champion Simulation team

Learning in RoboCup

1999 Champion Simulation team



Vision

- Computer vision
 - Shape modeling, object recognition, face detection...
- Robot vision 
 - Mobile camera, limited computation, color features

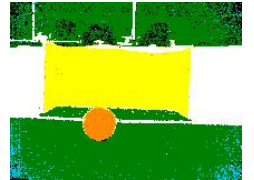
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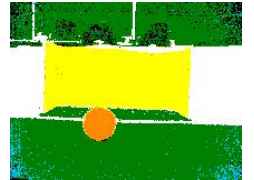
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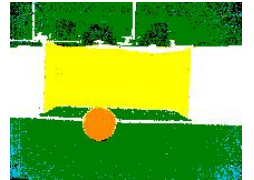
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Other Good AI Challenges

Trading agents



Autonomous vehicles



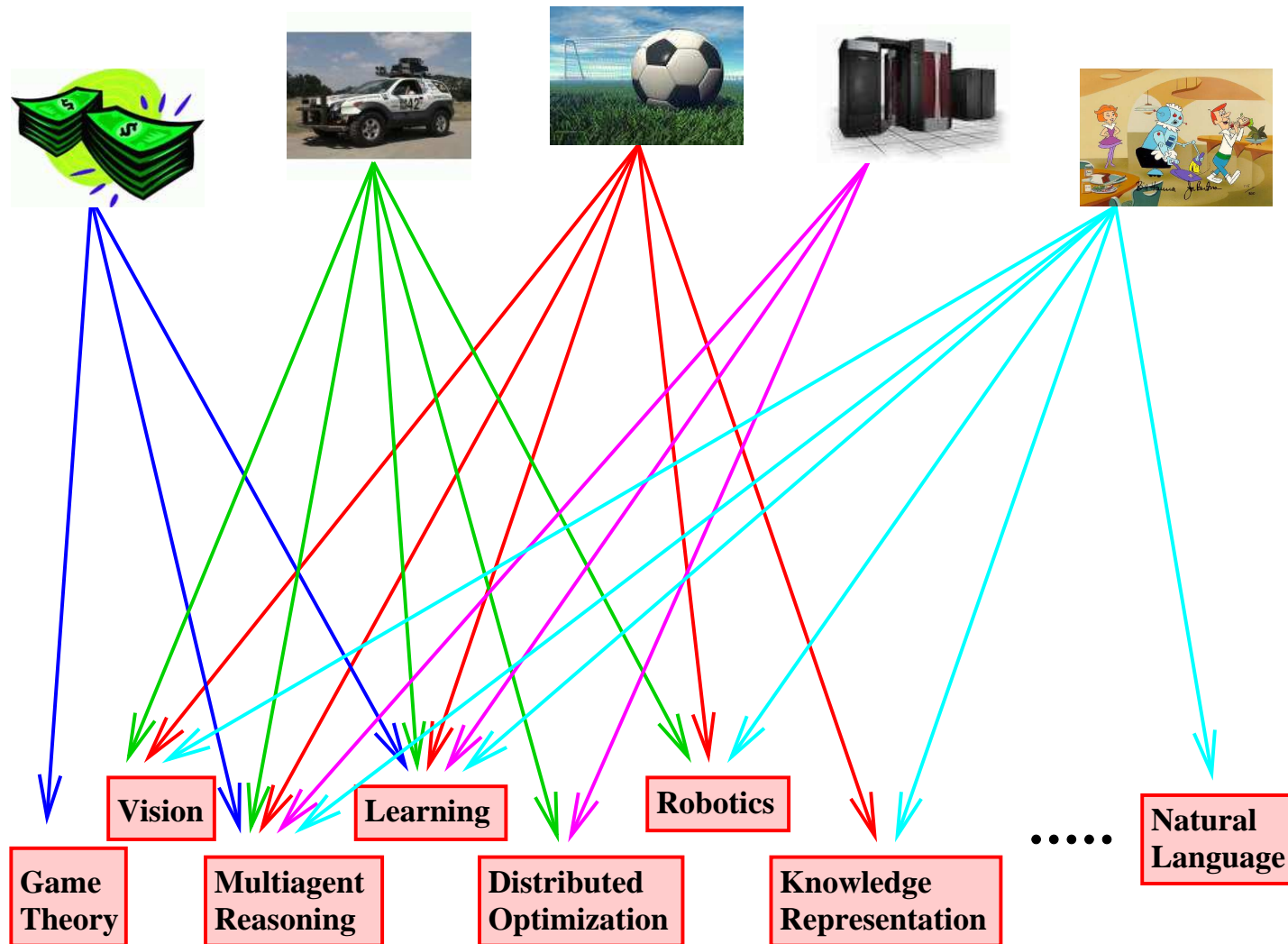
Autonomic computing



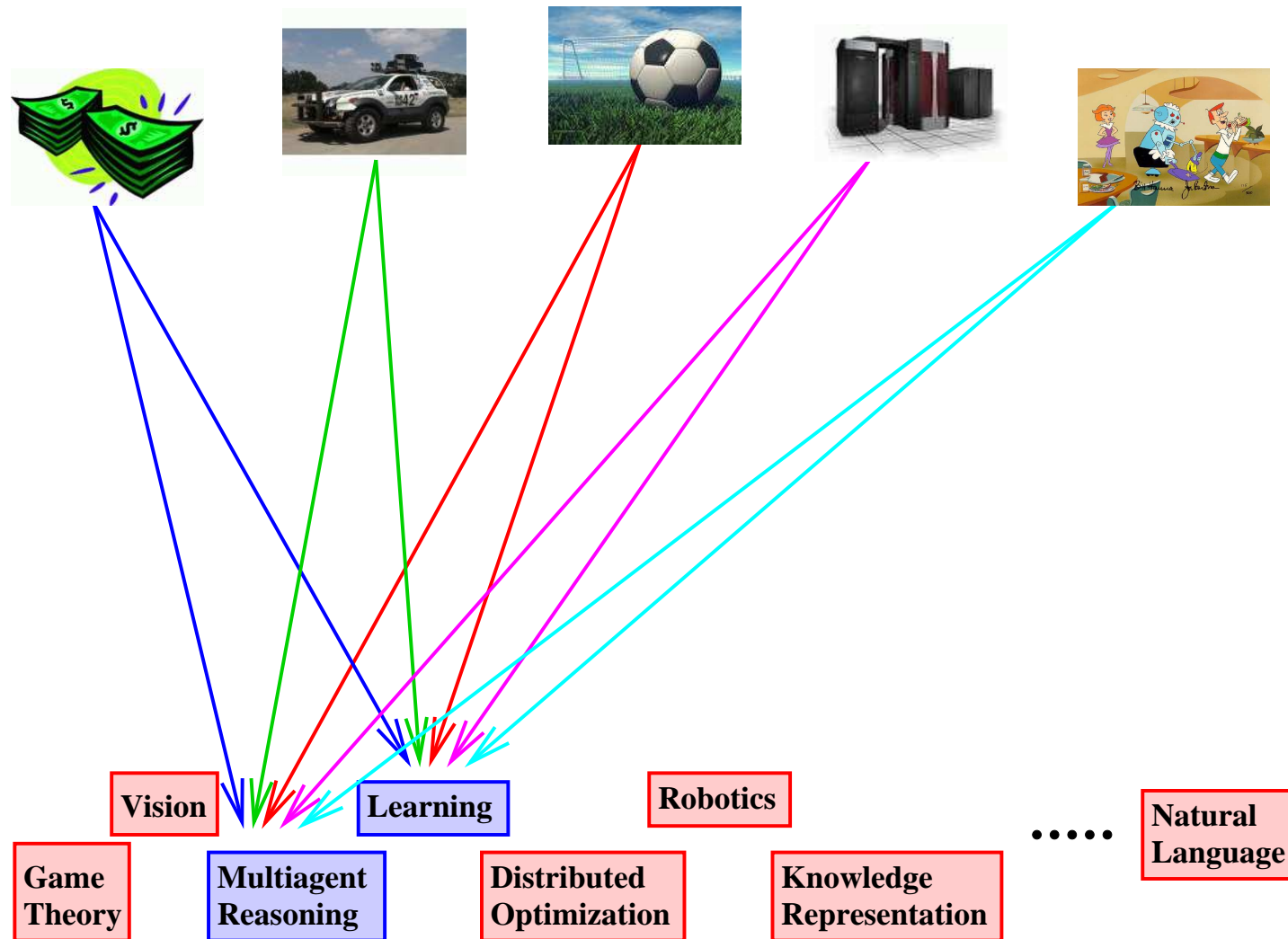
Socially assistive robots



Challenge Problems Drive Research



Learning and Multiagent Reasoning



Machine Learning

- Backgammon [Tesauro, '94]
- Helicopter control [Ng et al., '03]

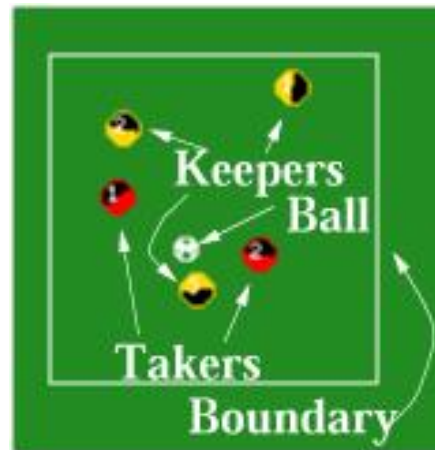


Machine Learning

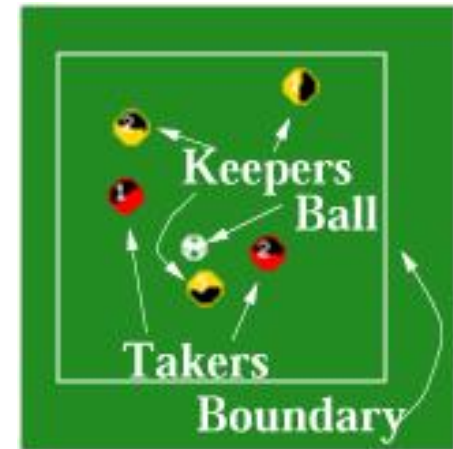
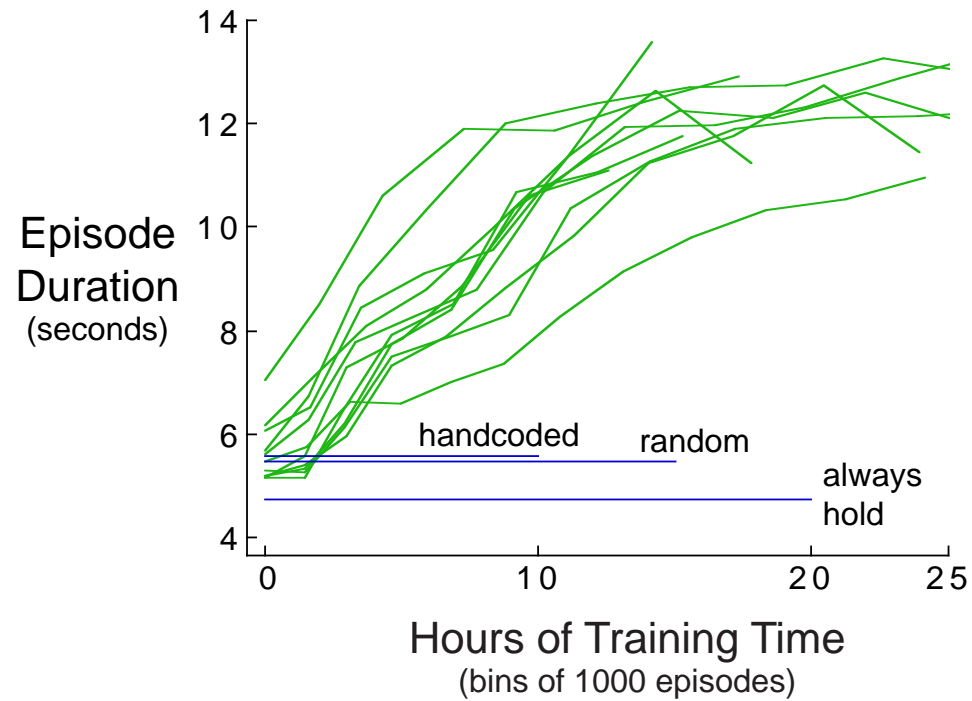
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- **RoboCup Soccer Keepaway** [Stone & Sutton, '01]



After Learning



Multiagent Reasoning

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- Once there is one, there will soon be many
- To coexist, agents need to interact

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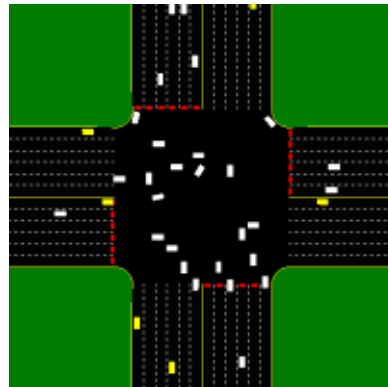
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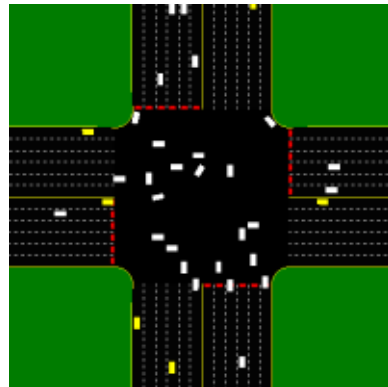
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Autonomous Bidding Agents

ATTac: champion travel agent



- Learns model of auction closing prices from past data
- Novel algorithm for conditional density estimation

TacTex: champion SCM agent



- Adapts procurement strategy based on recent data
- Predictive planning and scheduling algorithms

TacTex'09: champion Ad-Auctions agent

Other State-of-the-Art AI

- Deep Blue beats Kasparov
- Sojourner, Spirit, and Opportunity explore Mars
- NASA Remote Agent in Deep Space I probe explores solar system
- iRobot Roomba automated vacuum cleaner
- Automated speech/language systems for airline travel
- Spam filters using machine learning
- Question answering systems automatically answer factoid questions
- Usable machine translation through Google.

Ethics/Implications

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What happens **when** we achieve this goal

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A Walk through the Syllabus

Official syllabus is on-line

Workload Summary

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- Final 25%

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- Join the mailing list!

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- First reading assignment

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- First “programming” assignment