Course wrap up

CS 486/686
University of Waterloo
Lecture 24: November 29, 2012

Outline

- Course wrap up
- Final exam info
- Other AI courses
- AI jobs
- AI research

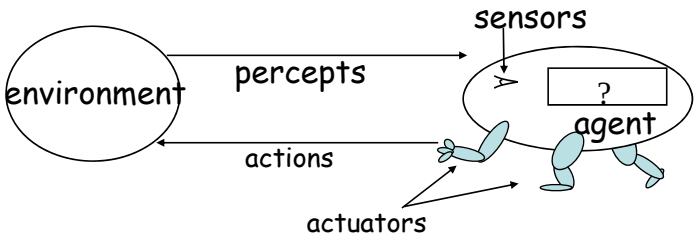
Topics Covered

- Knowledge representation
- Search algorithms
- Probabilistic Inference
- Decision Making under Uncertainty
- Machine Learning

Topics That We Didn't Cover

- Computer Vision
- Natural Language Processing
- Robotics
- Reinforcement Learning
- Multi-agent Systems

Agents and Environments



Agents include humans, robots, softbots, thermostats…

The agent function maps percepts to actions $f:P^* \rightarrow A$

The agent program runs on the physical architecture to produce f

Rational Agents

- Recall: A rational agent "does the right thing"
- Performance measure – success criteria
  - Evaluates a sequence of environment states
- A rational agent chooses whichever action maximizes the expected value of its performance measure given the percept sequence to date
  - Need to know performance measure, environment, possible actions, percept sequence
- Rationality ≠ Omniscience, Perfection, Success
- Rationality ➔ exploration, learning, autonomy

Bounded Rationality

- What if the best strategy given past percepts cannot be implemented with today's computers?
- We have seen many theories for rational agents but what if those theories are intractable?
- Bounded rationality: find best implementable strategy given past percepts

Other AI courses

- CS485/685: Machine Learning (W13)
- CS886: Foundation of Social Computing (W13)
- CS784: Computational Linguistics (S13)
- CS886: Sequential Decision Making and Reinforcement Learning (S13)
- CS786: Prob. Inference and Machine Learning
- CS498/698: Computer Vision
- STAT440/840: Computational Inference
- STAT441/841: Statistical Learning – Classification
- STAT442/890 Data visualization

CS485/685: Machine Learning

- Instructors: Shai Ben David and Pascal Poupart
- Topics in the last offering (Winter 2012)
  - **Algorithms:** Decision trees, nearest neighbor, statistical learning, linear regression, linear classification, perceptrons, neural networks, Gaussian processes, support vector machines
  - **Learning theory:** Probably approximately correct (PAC) learning, learning via uniform convergence, no-free-lunch theorem, Vapnik-Chervonenkis (VC) dimension, hypothesis dependent bounds, nearest neighbor analysis, computational complexity

CS886: Sequential Decision Making and Reinforcement Learning

- Instructor: Pascal Poupart
- Term: Spring 2013 (online course)
- Topics:
  - **Planning**
    - Markov Decision Processes
    - Planning as Inference
    - Decentralized planning
  - **Reinforcement Learning**
    - Bayesian Reinforcement Learning
    - Kernel based approximations
    - Feature extraction
  - **Applications:**
    - Dialog management
    - Robotics

AI research group

- Web: ai.uwaterloo.ca
- Professors:
  - Shai Ben David (learning theory)
  - Chrysanne DiMarco (natural language processing)
  - Peter Van Beek (constraint programming)
  - Robin Cohen (multi-agent systems, user modeling)
  - Pascal Poupart (machine learning, health informatics, natural language processing)
  - Jesse Hoey (health informatics, machine learning, computer vision)
  - Daniel Lizotte (health informatics, machine learning)
  - Kate Larson (game theory, mechanism design)
  - Richard Mann (computer vision)

My research projects

- Reasoning Under Uncertainty and Machine Learning
  - Partially observable Markov decision processes
  - Bayesian reinforcement learning
- Natural language processing
  - Spoken and textual dialog management (chatbots)
  - Speech processing (verbal repetition detection)
- Health Informatics
  - Smart walkers (activity recognition, limb tracking)
  - Symptom monitoring for Alzheimer's disease

AI jobs

- Very few "AI companies"
- AI tends to be embedded in many applications
- Many companies have AI R&D groups
  - Intel, Microsoft, IBM, Google, NEC, Yahoo, HP, InTheChat
- AI is a growing industry
- Has the potential to revolutionize the computer industry!