Course wrap up

December 3, 2009
CS 486/686
University of Waterloo

Outline

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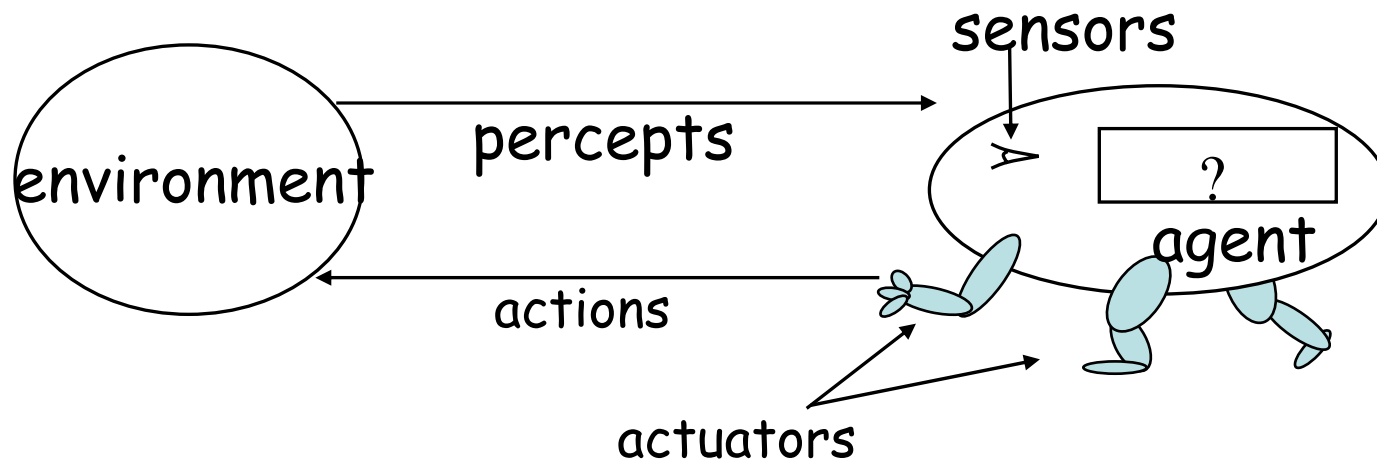- AI research

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 $\neq$ Omniscience, Perfection, Success
- Rationality $\rightarrow$ 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

- CS489/689: Machine Learning (W10)
- CS798: Multiagent Systems (W10)
- CS886: Decision Making Under Uncertainty (W10)
- CS886: Perception as Bayesian Inference (W10)
- CS798: Logic in Computer Science or Theoretical Foundations of Clustering (S10)
- CS848: Machine Learning for Info Retrieval (F10)
- CS886: Bayesian Data Analysis (F10)
- STAT440/840: Computational Inference
- STAT441/841: Statistical Learning – Classification
- STAT442/890 Data visualization

CS489/689: Machine Learning

- Instructor: Pascal Poupart
- Term: Winter 2010
- Topics:
  - Theoretical Foundation of Machine Learning
    - Learning theory
    - Bayesian learning
  - Types of learning:
    - Supervised learning
    - Unsupervised & semi-supervised learning
    - Reinforcement learning
  - Specific models/algorithms
    - Perceptrons
    - Neural networks
    - Support vector machines
    - Gaussian processes
    - Ensemble learning

CS886: Decision Making Under Uncertainty

- Instructor: Pascal Poupart
- Term: Winter 2010
- Topics:
  - Reasoning under uncertainty
  - Sequential decision making
  - Markov decision processes
  - Reinforcement learning
  - Multi-agent systems

CS886: Bayesian Data Analysis

- Instructor: Pascal Poupart
- Term: Fall 2010
- Topics:
  - Bayesian learning
  - Gaussian processes
  - Dirichlet processes
  - Hierarchical priors

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 (reasoning under uncertainty, machine learning, natural language processing)
  - Kate Larson (game theory, mechanism design)
  - Richard Mann (computational vision)

My research projects

- Decision Making under uncertainty
  - Partially observable Markov decision processes
  - Bayesian reinforcement learning
- Intelligent assistive technologies
  - Smart walkers
  - Symptom monitoring for Alzheimer's disease
- Natural language processing
  - Document clustering
  - Spoken dialogue systems
- Machine learning
  - Semi-supervised learning
  - Cluster Labeling

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
- AI is a growing industry
- Has the potential to revolutionize the computer industry!