Agents observe, act, and receive reward in an uncertain world.

**Our Research**
- Computational foundations of automated reasoning and action
- Uncertainty and limited resources
- Optimal and approximate reasoning
- Probabilistic reasoning and decision-theoretic principles
- Meta-level control mechanisms
- Mathematical models of collaborative or adversarial domains
- Bounded rationality and opponent models

**Application Areas**
- Autonomous information gathering
- Combinatorial optimization (SAT)
- Probabilistic inference
- Mobile robot navigation
- Real-time heuristic search
- Planning and plan execution
- Database query optimization
- Distributed coordination

**Models of Rational Agency**
- Trade-offs between computational resources and utility
- Run time, processor capacity, and communication bandwidth
- Approaches:
  - Parallel Portfolios
  - Contract Algorithms
  - Anytime Algorithms

**Decentralized Coordination Problems**
- Decentralized (Partially Observable) Markov Decision Processes
- Partially Observable Stochastic Games
- Coordination in spite of stochasticity and limited information

**Complexity Analysis**
- Decentralized problems are highly complex.

**Solution Techniques**
- The first optimal DP algorithm for Dec-POMDPs.
- Bounded-memory approximation algorithms.
- Exploiting independence relations.

**Planning and Acting under Uncertainty**
- Agents plan in real time, acting in dynamic, stochastic worlds.
- Scalable algorithms
- Bounded optimality in approximation
- Approaches:
  - Nonlinear programming
  - Exploit structured agent interactions to simplify decisions.
  - Exploit belief-space structure for pruning in DP
  - Symbolic methods such as use of Algebraic Decision Diagrams
  - Heuristic search

**Personnel and Contact Information**
- Principal Investigator: Shlomo Zilberstein (shlomo@cs.umass.edu)
- Administrative Assistant: Michele Roberts (michele@cs.umass.edu)
- Graduate Students: Martin Allen, Andrew Araujo, Christopher Amato, Stephen Ambrogio, Marek Petrik
- Contact: Resource-Bounded Reasoning Lab, Department of Computer Science, 126 CE Building, University of Massachusetts Amherst, MA 01003-9264, Tel: (413) 545-4189, Fax: (413) 545-1249, http://anytime.cs.umass.edu/