

Hard Problem #1: Learning unknown utility functions (or best actions/responses) and models for dynamics in a multi-agent games (blue, red, green agents) under time/computational resource constraints and nonstandard information patterns

What makes it difficult

- Cannot explore large behavior space in short time
- Slow convergence for even small problems
- Lack of adversarial models
- Uncertainty in models, sensing, environment
- Hard to distinguish combatants/noncombatants
- Hard to assess intent
- Limited information
- **Non-nested information patterns**
- Deception
- Non-Gaussian noise (alpha-stable)
- Course of modeling for probabilities

What can be exploited

- Prior probabilities
- Repeating short runs of dynamic games
- Structured models
- Time scale separation
- Coarse variables
- Brute force computations
- Your idea here ...

Benchmark problems:

- Pachter problem: scalar, two controllers, Gaussian noise, quadratic cost, each uses different measurement
- Missile intercept problem
- 5 UAVs looking for 5 combatants in urban environment