

# Statistical Learning and Inference Methods for Reasoning in Games

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## Outline

- Intro to Games
- Texas Hold'em Demo
- Hidden Markov Models – Structure Learning
- Bayesian Nets – Interpolating Conditional Density Trees
- Project Preview – Level 1 Reasoning in Poker using HMMs and Bayesian Nets
- Summary

In this lecture, we present two key techniques for reasoning in games. To motivate our talk, we begin with a demonstration from the game of Texas Hold'em. We use this demonstration to provoke some key questions in reasoning, and follow that up with lectures on two key techniques: Bayesian Nets and Hidden Markov Models. For these topics, we will begin with a review some of the fundamentals in each of these areas, then move into describing some more recent developments in research for the advanced portions of the talk. We then wrap up the information presented, and describe how we will use these methods in our final project.

## Why Games?

- Economic Models
- Combat Scenario Models
- AI Benchmarks
- Fun
- \$\$\$

I'd like to point out that lessons learned from modeling and learning games and game theory have been extended to a number of domains:

For example, Adam Smith's classic, "Wealth of Nations", can be modeled as a zero sum game. Also, simulation of warfare typically involves adversary modeling. Finally, games have a set of clearly defined rules, providing good AI benchmarks with a good way of evaluating algorithms on specific problem domains.

These are a few of the many domains where principles of games and game theory can be applied.