

Game Theory

March 21, 2025

Poker Game Reveal: 5pm, Mar 22

Basic Cash-in Poker Rules

- a hand (hidden info)
- a board, consists of a flop (3 cards), a turn (1 card) and a river (1 card)
- SB/BB: money put in by both players in each round
- Showdown: once no more community cards should be dealt, and all betting action has completed, the player with better hand wins the pot

Actions

- Bet
- Fold
- Throw

The Fundamental Theorem of Poker (FTP)

"Every time you play a hand differently from the way you would have played it if you could see your opponents' cards, they gain; and every time your opponents play a hand differently from the way they would if they could see your cards, you gain."

- Incomplete Information
- Optimal Decision
- Mimic Equilibrium Play

Equity, Ranges and EV Calculation

- Equity: share of the pot you expected to win on average if all hands go to showdown
- Ranges: assign opponents a distribution over possible hands based on their behaviors
- Expected Value (EV)

Building Blocks for a Strong Bot

- Hand Evaluation
- Uses uniform random outcomes (+1 for win, -1 for loss)
- Game-theoretic strategy
- Exploitative play

Using RL

- CFR (Counterfactual Regret Minimization) based methods
- Policy Gradients
- Genetic Algorithms
- And much more...