

AI Project Proposal

The Problem I Intend to Solve:

Playing blackjack at a casino is statistically a bad idea. The player has a chance of about 42 percent of winning any given hand. This means that playing more results in a higher chance of the player losing. However, there is a strategy called card counting that allows the player to gain a slight advantage over the house. A card counter wins by fluctuating their bets based on an educated guess of what will be dealt next. I plan to build an algorithm that counts cards and learns what betting amounts will result in a higher net win/loss.

The Uncertainties Involved:

There are a few uncertainties involved in simulating blackjack. The player can never know what the next card is going to be. The player can only see one of the dealer's cards. The player does not know when the dealer will shuffle next and may not know how many decks are being used.

Why the Problem is Non-trivial:

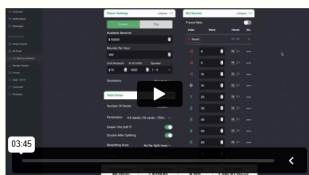
The problem is nontrivial due to the fact that a human being could not reasonably play thousands of hands of blackjack with different betting strategies to determine what works best. Even if a person did play thousands of hands of blackjack, and found a winning betting strategy, with 5 decks, they could very well encounter a blackjack table that uses 7 decks. The betting strategy for a table with 5 decks may be different compared to a strategy for a table with 7 decks.

Existing Solution Methods:

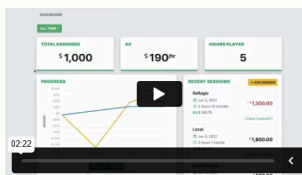
Card counting simulators that allow a user to set game parameters and test different bet spreads already exist. These softwares are built with a lot of settings for users to change so they can simulate the version of blackjack they plan to play.

- Popular card counting website with a simulator (found via forums)
 - <https://www.qfit.com/blackjack-simulator.htm>
- Blackjack website that has a card counting tool (hidden behind a paywall)
 - <https://www.blackjackapprenticeship.com/features/>

BANKROLL MANAGEMENT SOFTWARE



Risk vs Reward. That's what card counting is all about. But how do you know your risk? How much reward you should expect? Our Bankroll Manager answers those questions. Know how much to bet, and when to bet it for maximum profits.



Detailed record keeping may not be the most glamorous aspect of card counting, but our results tracker streamlines the whole process. Record your session length, wins, losses, EV, gathered intel, and watch your bankroll grow.

My Plan for Modeling and Solving the Problem:

I plan to solve the problem by simulating some consistent number of blackjack hands (while card counting) with different bet spreads. The project should return the bet spread that is advantageous for the given inputs (# of decks, # of hands to simulate, and player bankroll). The state space for the problem outlined will consist of all of the combinations of player cards (including when a player hits), dealer cards, player bankroll, win or loss state, if the player is hitting or staying, and the current betting strategy. The action space consists of what bet a player will place based on the current bet spread. The observations available to the player are the number of cards discarded, the number of cards that can still be dealt, and cards that have been dealt. I believe this problem could be solved using reinforcement learning. The program would find advantageous betting amounts for different true counts.

Youtube Tutorial:

To simulate the game of blackjack I will be using a tutorial I found on Youtube. This tutorial shows you how to build a blackjack game using Pygame. I believe the process of building the functionality of the base game will help me understand what I need to retrieve from the game state.

<https://www.youtube.com/watch?v=e3YkdOXhFpQ&t=166s>

GitHub Repo:

<https://github.com/eshanreed/AIFinalProject>