Developing strategies for the bidding card game ’Diamonds’ with Gemini

ANVESHA SINGH

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1 Introduction

Diamonds, a deceptively simple game of bidding and trick-taking, thrives on calculated risk and a keen understanding of your opponents. But what if you had an additional partner at the table â a partner fueled by artificial intelligence? This report explores the potential of GeminiAI, a powerful AI tool, to not only enhance our Diamonds strategy but also provide valuable insights into how AI itself operates.

Through this exploration, we aim to bridge the gap between human intuition and AI-driven insights. We will not only present winning strategies for Diamonds but also dissect the "why" behind them, fostering a deeper understanding of how GeminiAI arrives at its conclusions. This knowledge will empower us to make informed decisions not just in the context of Diamonds, but in other situations where we encounter AI.

2 Problem Statement

The classic game Diamonds demands strategic bidding and risk assessment. While players hone skills through experience, a gap exists in understanding optimal gameplay. This assignment bridges that gap by utilizing GeminiAI, a powerful AI tool.

Boost Diamonds Strategy: Leverage GeminiAI's analysis to develop winning tactics by evaluating hand strength, predicting opponent moves, and suggesting optimal bids/plays.

Simplify AI: Understand how AI "thinks" by studying GeminiAI's decision-making process. This includes analyzing its hand evaluation, opponent prediction, and strategic recommendation generation.

3 Rules of the Game

Objective: Be the player with the most points at the end of the game.

Players: 2 or more

Deck: A standard deck of cards. Remove the diamonds suit entirely. Shuffle the remaining cards (hearts, clubs, spades) and deal them all face down to the players, ensuring everyone gets an equal number of cards.

Diamond Pile: Shuffle the diamond suit deck and place it face down in the center of the table. This is the auction pile.

Bidding:

- Reveal the top card from the diamond pile. This is the diamond being auctioned.
- Each player, in turn order, secretly chooses one card from their hand and places it face down in front of them as their bid.
- Once everyone has placed a bid, reveal all the bids simultaneously.
- The player who played the card with the highest point value wins the bidding. Use the following ranking system (from lowest to highest):
- 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack (J), Queen (Q), King (K), Ace (A)
- If multiple players have the same highest bid, the diamond's point value is divided equally amongst them (rounded down if necessary).

Winning the Diamond:

The winning bidder takes the revealed diamond card and adds its point value (based on the ranking system above) to their personal score. Discard the winning player's bid card face down into a separate discard pile.

Next Round:

Repeat steps 1-5 above to auction the next diamond card from the pile.

Ending the Game:

The game ends when all the diamonds have been auctioned. Winning:
The player with the most points at the end of the game wins!

4 Teaching Gemini the Game

At first, the AI seemed surprisingly intuitive about the game as giving it a simple prompt with the basic rules made it capable to rewrite the rules correctly. However, once a game was played with the AI in order to test it, Gemini soon faltered making a lot of mistakes revealing that it was simply pretending to understand the rules clearly.

There were a lot of extremely critical errors in the AI's conceptual understanding of the game such as:

- The AI thought that bidding a card equal to the Diamond currently on auction automatically made the bidder the winner no matter what the bid of the other players was.
- Sometimes, the AI would declare a player with lower bid the winner for no reason.
- It didn't realise that the diamonds being auctioned are randomized.
- It didn't realise that a card that has been bid once cannot be used to bid again and has to be discarded.
- It kept believing that both the bids don't have to be revealed if one of them was the clear winner. It would keep its' bid hidden if my card was the winner.
- The AI needed to be told that there will be exactly 13 rounds and there is no option to 'pass' a round for a player.
- It tended to forget the previous correction that was made once a new correction was made.

Overall, there were a lot of conceptual errors and sometimes, the AI would make the exact same mistake even after being told and apologising for it. There were also some gaps in the information passed to it at the beginning which were solved while simulating a game with it.

5 Winning Strategies

Strategies to win the game by Gemini:

General Strategies:

Card Counting (Light): Keep track of high-value diamonds played to adjust your bids for remaining ones.

Balance Risk and Reward: Play high cards to win valuable diamonds, but be careful not to lose them with even higher bids from your opponent.

Observe Bidding Patterns: Watch how your opponent bids. Are they cautious or aggressive? Adapt your strategy accordingly.

Bidding Strategies:

Bluffing: Play a lower card confidently to trick your opponent into thinking you have a higher one. Use sparingly!

Sandbagging: Hold onto high cards for later rounds, especially if you suspect valuable diamonds remain. Risky if your opponent wins them all early.

Adapting to Revealed Diamonds: Consider the revealed diamond's value. Play lower cards for less valuable diamonds and higher cards for the big ones.

Remember: These are flexible guidelines. The best strategy depends on the situation and your opponent's behavior. Practice, observe, and adapt to become a Diamond master!

6 Conclusion

When the AI was first asked for strategies to win the game, it gave extremely basic strategies that can be used for any card game involving luck and skill. If asked for a code to play the game with, all iterations of the code had various errors, especially a lot of conceptual ones.

However, after playing multiple rounds with the user and slowly understanding how the game is played with the user pointing out its mistake after every round, the AI was able to provide extremely thorough and customised strategies for the game of Diamonds specifically. Even the code became extremely solid code with very few errors and almost no conceptual errors compared to before.

This suggests that the AI also works on the "Practice makes perfect" motto as playing the game and understanding each and every possible test case helped build its understanding of the game.

The AI was also able to implement some of the basic winning strategies it provided into the code to help the user bid. The given link contains the initial code the AI provided, the code after playing multiple rounds with the user and also the code incorporating some of the basic strategies:

Google Colab Link

7 References

Gemini Chat Link