Developing strategies for the bidding card game 'Diamonds' with Gen AI

GenAI Tool used: ChatGPT

1. INTRODUCTION

Diamonds is a strategic card game where players compete to collect the most points by bidding on diamond cards. Each player receives a suit of cards other than diamonds and participates in auctions to win diamond cards. The game revolves around strategic bidding, risk management, and maximizing point accumulation. Players must carefully evaluate their hands, assess the value of diamond cards, and employ winning strategies to outwit their opponents. With its dynamic gameplay and strategic depth, Diamonds offers an engaging experience for players of all skill levels.

2. PROBLEM STATEMENT

The game of Diamonds has the following rules:-
- Each player gets a suit of cards other than the diamond suit.
- The diamond cards are then shuffled and put on auction one by one.
- All the players must bid with one of their own cards face down.
- The banker gives the diamond card to the highest bid, i.e. the bid with the most points.
- Point hierarchy: 2<3<4<5<6<7<8<9<T<J<Q<K
- The winning player gets the points of the diamond card to their column in the table.
- If there are multiple players that have the highest bid with the same card, the points from the diamond card are divided equally among them.
- The player with the most points wins at the end of the game.

3. TEACHING GEN AI THE GAME

Here's my transcript with ChatGPT, teaching it to learn the rules.

RI

You
Hi, I would like to give you some instructions about a Diamonds Card Game. You have to understand them, and play as 3rd player with me. The instructions are : The game of Diamonds has the following rules:- • Each player gets a suit of cards other than the diamond suit. • The diamond cards are then shuffled and put on auction one by one. • All the players must bid with one of their own cards face down. • The banker gives the diamond card to the highest bid, i.e. the bid with the most points. • Point hierarchy: 2<3<4<5<6<7<8<9<T<J<Q<K<A • The winning player gets the points of the diamond card to their column in the table. • If there are multiple players that have the highest bid with the same card, the points from the diamond card are divided equally among them. • The player with the most points wins at the end of the game. Did you get the game?

ChatGPT

ChatGPT
Yes, I understand the rules of the Diamonds card game. As the third player, I'll participate in the auction rounds, bidding with one of my cards face down. Let's begin when you're ready!

RI

You
I am ready, tell me how will the execution of the game will go about?

ChatGPT

ChatGPT
Great! Here's how we'll proceed with the execution of the game:

1. **Setup**:

- Each player, including myself and you, gets a suit of cards other than diamonds.
- The diamond cards are shuffled and placed face down to form the auction pile.

2. **Auction Rounds**:
   - We take turns revealing one diamond card from the auction pile.
   - Each player, including myself and you, secretly chooses one card from their hand to bid with and places it face down.
   - Once all bids are placed, we reveal our bids simultaneously.
   - The highest bid, according to the point hierarchy, wins the diamond card.
   - If multiple players bid the same highest card, the points from the diamond card are divided equally among them.

3. **Scoring**:
   - The player who wins the diamond card adds the points of that card to their column in the table.
   - If points are divided among multiple players, each receives an equal share.

4. **Repeat**:
   - We continue with auction rounds until all diamond cards are auctioned off.

5. **End of Game**:
   - Once all diamond cards are auctioned, we tally up the points for each player.
   - The player with the most points wins the game.

Shall we begin with the first auction round?

RI

You

yes

ChatGPT

ChatGPT

Excellent! Let's start the first auction round:

1. I'll draw the top card from the auction pile and reveal it. It is the 7 of Diamonds.
2. Each player, including myself and you, will now choose one card from our hands to bid with and place it face down.
3. Once we're all ready, we'll reveal our bids simultaneously.

Please select a card from your hand and let me know when you're ready to reveal our bids.

RI

You

10 of Clubs

ChatGPT

ChatGPT

Thank you for your bid. Now, let's reveal our bids:

- My bid: I chose the 9 of Spades.
- Your bid: You chose the 10 of Clubs.

Since your bid with the 10 of Clubs is higher according to the point hierarchy, you win the 7 of Diamonds. Congratulations! You'll add 7 points to your column.

Shall we proceed to the next auction round?

RI

You

Yes

ChatGPT

ChatGPT

Great! Let's continue with the next auction round:

1. I'll draw the next card from the auction pile and reveal it. It is the Jack of Diamonds.
2. Each player, including myself and you, will now choose one card from our hands to bid with and place it face down.

3. Once we're all ready, we'll reveal our bids simultaneously.

Please select a card from your hand and let me know when you're ready to reveal our bids.

RI

You
Jack of Hearts

ChatGPT

ChatGPT
Thank you for your bid. Now, let's reveal our bids:

- My bid: I chose the Queen of Spades.
- Your bid: You chose the Jack of Hearts.

Since your bid with the Jack of Hearts is higher according to the point hierarchy, you win the Jack of Diamonds. Congratulations! You'll add 11 points to your column.

Shall we proceed to the next auction round?

As, we can observe in the last bid, my card was a "Jack" which has lower points in hierarchy than the AI's card which was "Queen", still it declared me as the winner of this bid. So, I prompted ChatGPT with the following:

"But, Queen has higher point hierarchy as mentioned in the rules?".

As usual, it appologised, and continued. Again, in the later stages, it made the same mistake. This time I prompted differently:

"Please first understand and memorize all the rules, then we can continue. Here are the rules: The game of Diamonds has the following rules:- • Each player gets a suit of cards other than the diamond suit. • The diamond cards are then shuffled and put on auction one by one. • All the players must bid with one of their own cards face down. • The banker gives the diamond card to the highest bid, i.e. the bid with the most points. • Point hierarchy: 2<3<4<5<6<7<8<9<T<J<Q<K<A • The winning player gets the points of the diamond card to their column in the table. • If there are multiple players that have the highest bid with the same card, the points from the diamond card are divided equally among them. • The player with the most points wins at the end of the game.".

After this prompt, it did not make any mistakes in the future bids.

4. ITERATING UPON STRATEGY

Now I asked GPT for some winning strategies for this game. It gave a quite impressive answer.

"Certainly! Here are some winning strategies for the Diamonds card game:

1. **Understand the Point Hierarchy**: Memorize the point hierarchy ($2 < 3 < 4 < 5 < 6 < 7 < 8 < 9 < 10 < J < Q < K < A$) to make informed bidding decisions.
2. **Evaluate Your Hand**: Assess the strength of your hand before each auction round. Consider the cards you have in your suit and their point values.
3. **Bidding Conservatively**: Bid conservatively when you have lower-value cards in your hand. Save higher-value cards for rounds with valuable diamond cards.
4. **Strategic Use of High-Value Cards**: Use high-value cards strategically. Save them for rounds with diamond cards that have higher point values to increase your chances of winning those rounds.
5. **Observing Opponents' Bids**: Pay attention to the bids of your opponents. If they consistently bid with low-value cards, you may have an opportunity to win rounds with higher-value diamond cards.

6. **Adjusting Bidding Strategy**: Adjust your bidding strategy based on the current state of the game and the cards that have been auctioned. Be flexible and adapt to the changing dynamics of the game.
7. **Managing Risk**: Assess the risk versus reward of each bid. Avoid overbidding on diamond cards with lower point values unless you have a strong hand or believe it's necessary to prevent opponents from winning.
8. **Maximizing Points**: Aim to win diamond cards with higher point values to accumulate more points. However, be mindful of not overcommitting resources and ending up with fewer points overall.
9. **Playing Mind Games**: Use bluffing and psychological tactics to influence your opponents' bidding decisions. Sometimes, strategic misinformation or unpredictability can work in your favor.
10. **Track Points**: Keep track of your own points and those of your opponents throughout the game. This will help you make informed decisions and strategize effectively.

By applying these strategies, you can increase your chances of success in the Diamonds card game.

5. CODE

I again prompted it, to write the approach for writing the code for this game, using these strategies. It again gave a wonderful answer. Now I asked it to write the code.

Sure, I'll provide a simplified Python code for the AI player in the Diamonds card game. This code will focus on the bidding strategy for the AI player:

```python
import random

# Define the point hierarchy
point_hierarchy = {
    '2': 2, '3': 3, '4': 4, '5': 5, '6': 6, '7': 7, '8': 8, '9': 9, 'T': 10, 'J':
11, 'Q': 12, 'K': 13, 'A': 14
}

# Define the AI bidding strategy function
def ai_bid(hand, current_bid, diamond_card):
    # Evaluate the strength of the AI's hand
    hand_strength = evaluate_hand(hand)

    # Calculate the maximum bid the AI can make based on its hand strength
    max_bid = calculate_max_bid(hand_strength)

    # Determine the bid to make based on current bid and diamond card value
    if max_bid >= current_bid + diamond_card:
        bid = current_bid + diamond_card  # Bid just enough to win the card
    else:
        bid = max_bid  # Bid the maximum amount AI can afford

    return bid

# Define the function to evaluate the strength of AI's hand
def evaluate_hand(hand):
    total_points = sum(point_hierarchy[card[0]] for card in hand)
    return total_points

# Define the function to calculate the maximum bid based on hand strength
def calculate_max_bid(hand_strength):
    # Example: Simple strategy - bid 70% of hand strength
    max_bid = int(0.7 * hand_strength)
    return max_bid
```

```
# Example usage
hand = ['2 of Hearts', '5 of Clubs', '10 of Diamonds', 'K of Spades']
current_bid = 10
diamond_card = 8

ai_bid_amount = ai_bid(hand, current_bid, diamond_card)
print("AI bids:", ai_bid_amount)
```

This code provides a basic framework for the AI player's bidding strategy. It evaluates the strength of the AI's hand based on the point values of the cards, calculates the maximum bid the AI can afford, and then decides on the bid amount based on the current bid and value of the diamond card.

You can further enhance this code by incorporating more sophisticated evaluation functions, adaptive bidding strategies, and simulation/testing mechanisms to refine the AI player's behavior.

6. ANALYSIS AND CONCLUSION

From this conversation with ChatGPT, I learnt how to teach an AI a cards game. Also, I observed that while explaining the rules, the AI may not understand it in one iteration but since it is designed to please users, it will respond positively stating that it has understood each rule. One has to explicitly define some unknown terms in the rules, like in this case, J, K, Q, A were unknown to GPT. The code generated seems incomplete. However, the overall learning and teaching experience is impressive.