Winning at Poker: Analyzing My Gameplay Through Data and GTO Frameworks

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Introduction

Why did I choose to explore this topic?

1 HKU Hall

As I entered the hall, I noticed my floormates gathered around a table, engrossed in a game of poKer. Curious, I decided to join them, even though I had no prior experience with the game.

2 Losses Due to Bad LucK?

Throughout last semester, every time I played poKer, I found myself consistently losing. I began to see poKer as a game largely influenced by lucK.

3 Probability and GTO

A friend mentioned a concept called GTO, or Game Theory Optimal, which provides strategies for playing poKer with every possible hand. Intrigued, I thought, 'Why not analyze it and improve my game?

Expected Outcome

1 Win Rate

By analyzing the results of all my hands, I calculated my win rate when I knew nothing about poker.

2 Type of Player

By analyzing my actions during games, I aim to understand what type of poker player I am.

3 GTO

Comparing my gameplay to GTO preflop suggestions, I'll check if my hand choices align with GTO recommendations.

4 Break the myth

Identify the reasons for my losses

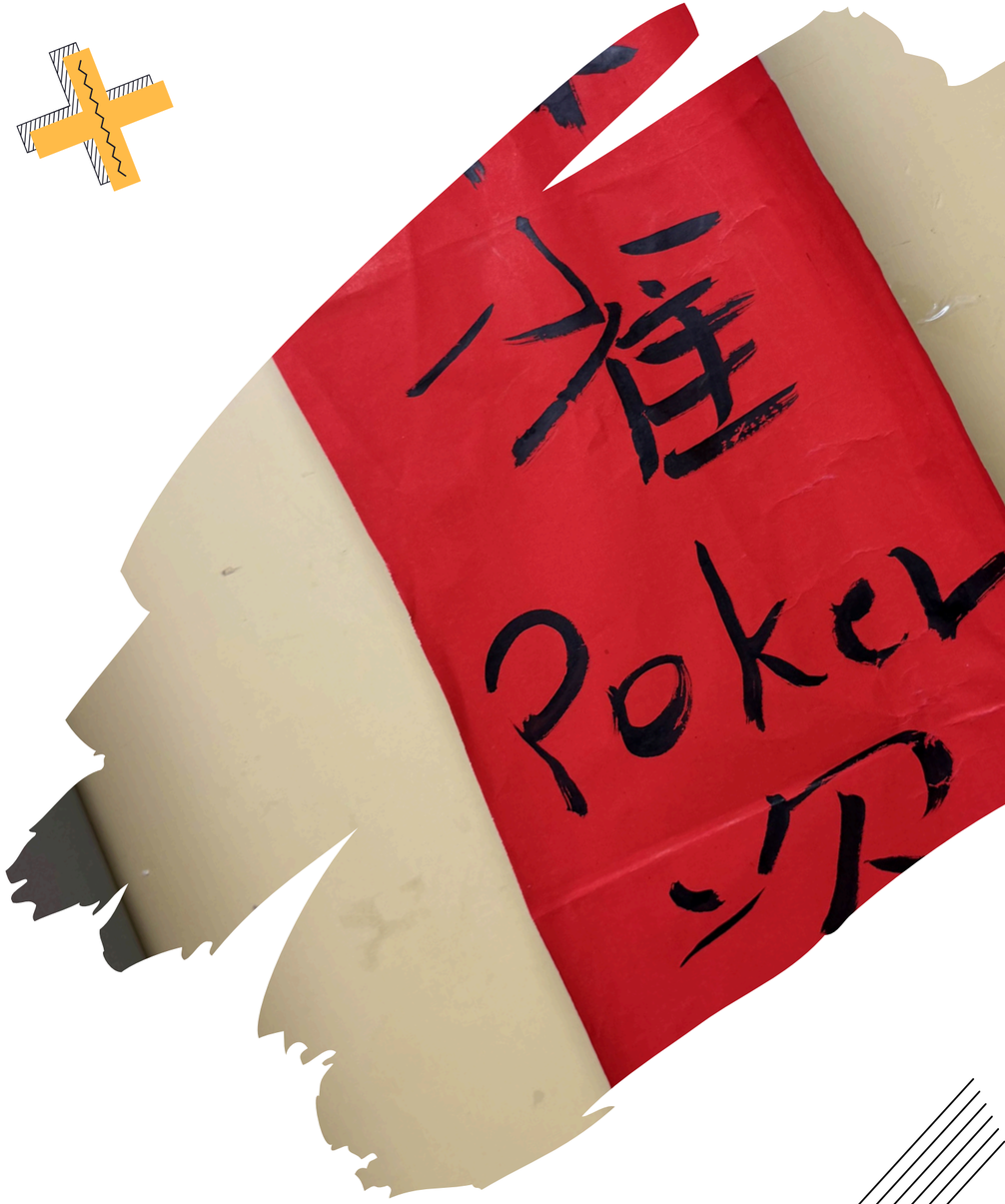
Why use Data Science & why it is important?

Why Data Science?

Poker is a game rich in math, involving probabilities of drawing cards, bet sizing, and money management. Clearly, data analysis can provide us with the expected value.

Why important?

I love having fun with friends, but losing money in poker breaks my heart. Analyzing the game and changing my mindset and strategy would help



Data Set

1 Data Source

Record of actual hands played from March 13 to April 10.

	Date	Hand	Suit.Not.Suit	Actions	NumberOfAction	Position	MyAsset
1	2025-03-13	63	o	fold	1	D	105
2	2025-03-13	Q9	o	fold	1	-1	105
3	2025-03-13	33	p	bet6_check_fold	3	-2	99
4	2025-03-13	AJ	o	fold	1	B	97
5	2025-03-13	A6	o	call6_allin	2	S	0

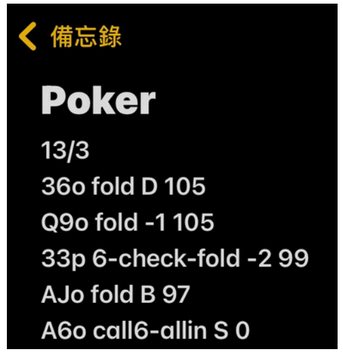
2 Tools

Use iOS Notes to jot down the details of my hands immediately.

Transfer the .txt file to RStudio for analysis.

3 Data Cleaning

Convert the raw data into a formatted data frame, separating it by date and game into tables.




```
Number of daily tables: 6
Dates in tables: 2025-03-13, 2025-0
Number of final session tables: 11
Table: Table20250313Game1
Table: Table20250313Game2
Table: Table20250314Game1
Table: Table20250318Game1
Table: Table20250318Game2
Table: Table20250318Game3
Table: Table20250319Game1
Table: Table20250319Game2
Table: Table20250321Game1
Table: Table20250321Game2
Table: Table20250410Game1
```

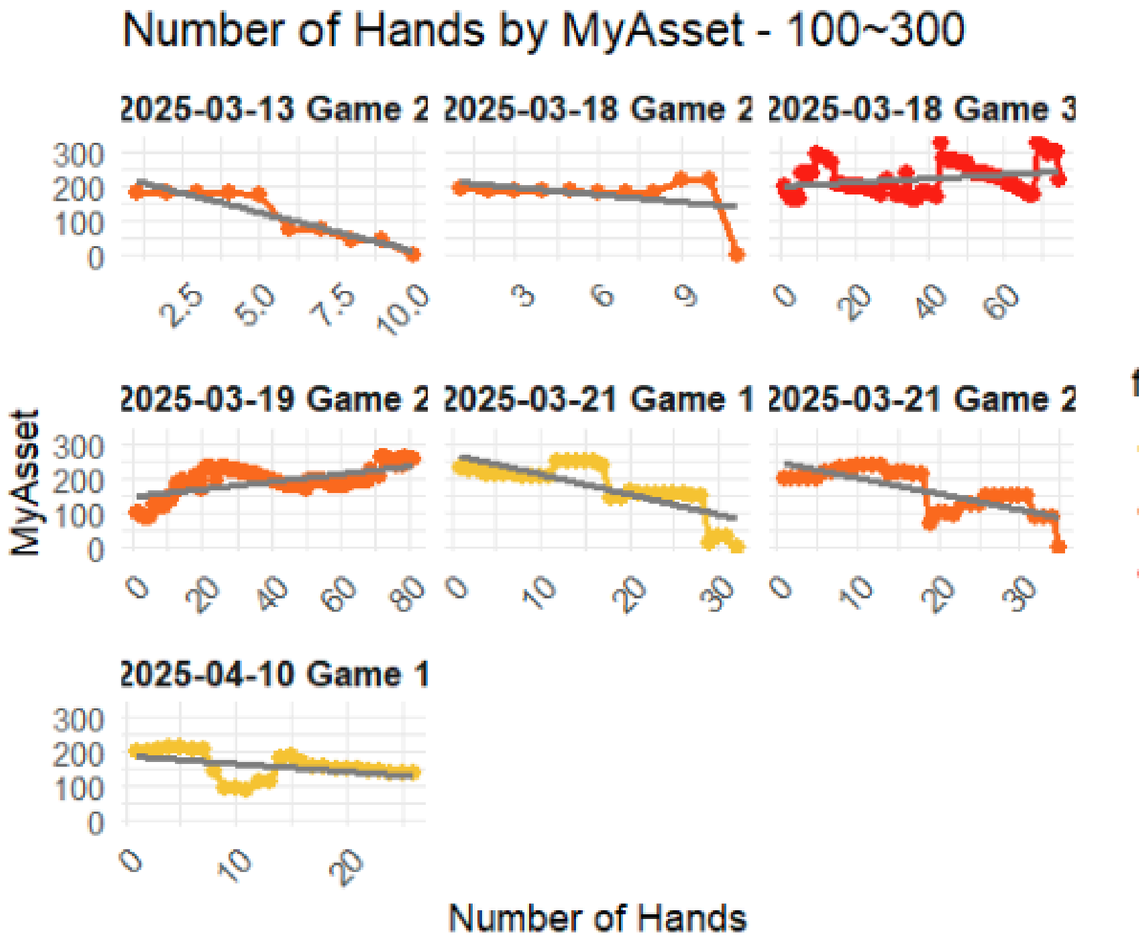
Pattern Analysis

Observation:

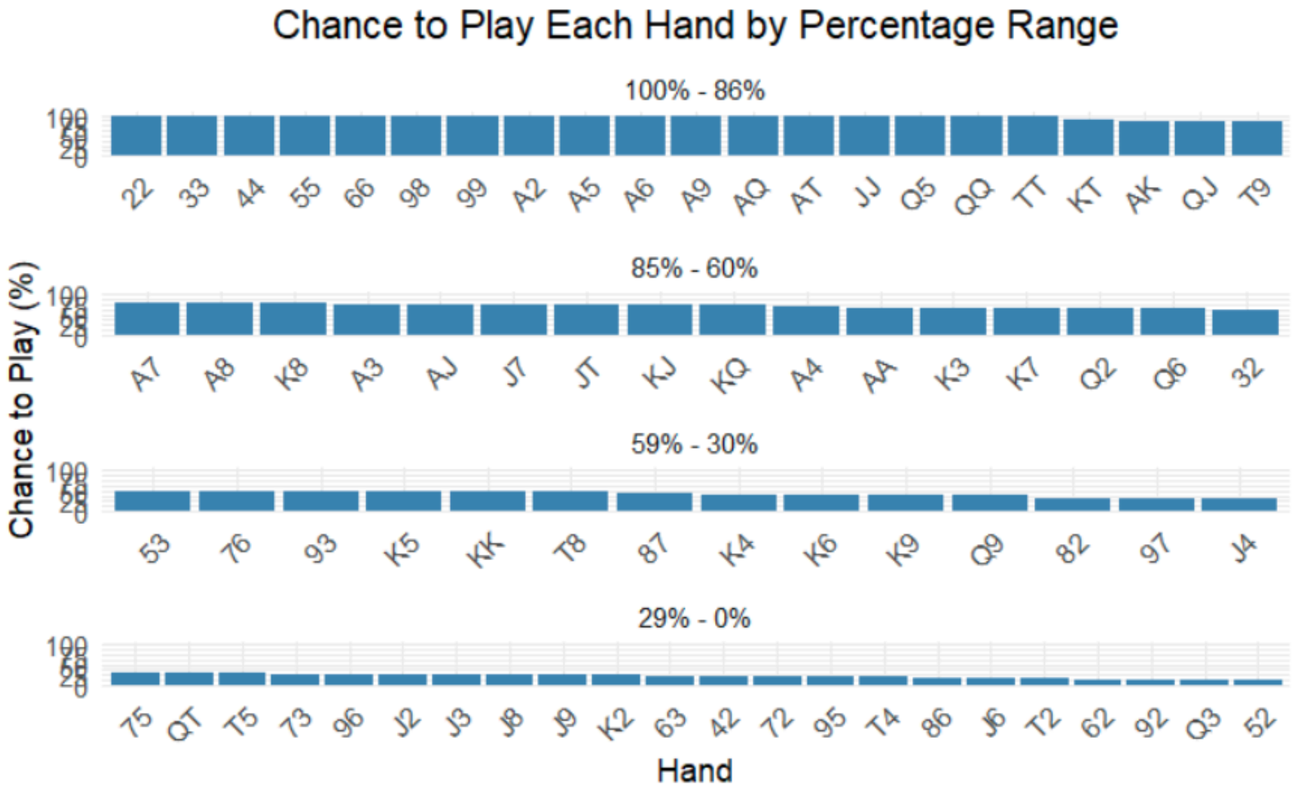
Most of the plot shows a decreasing trend, with only a few instances of increasing or flat trends.

This indicates that I was losing in poKer most of the time, with only a few wins.

Is it due to luck, or is it a problem with my strategy?



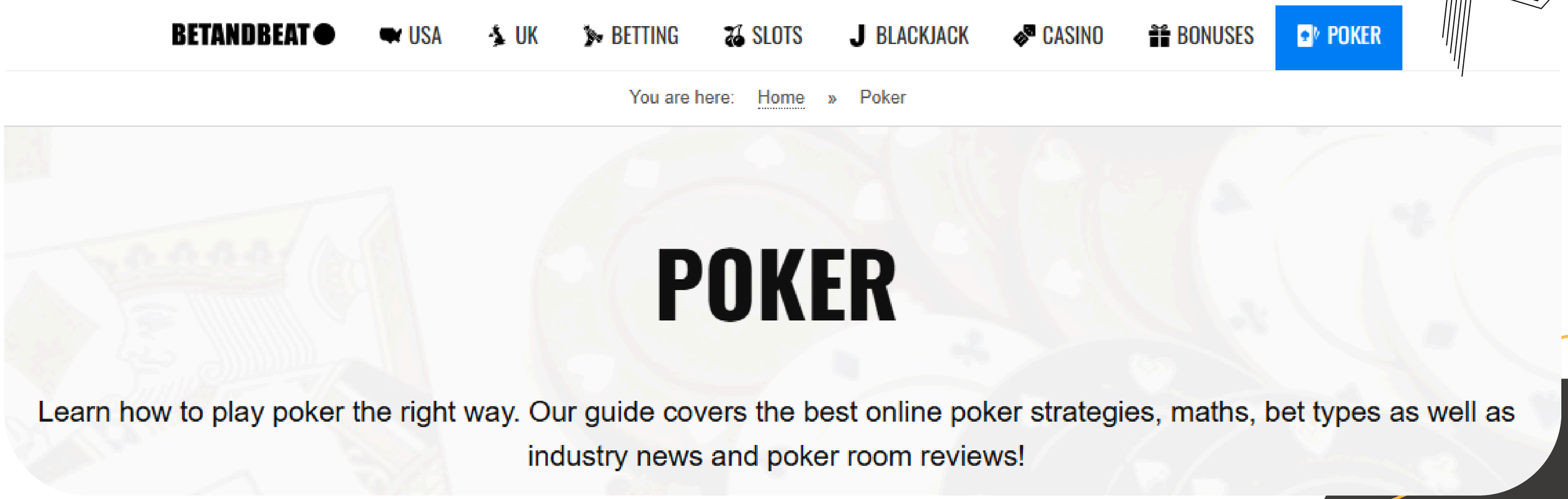
Examine my preferred playing hands



Observation:

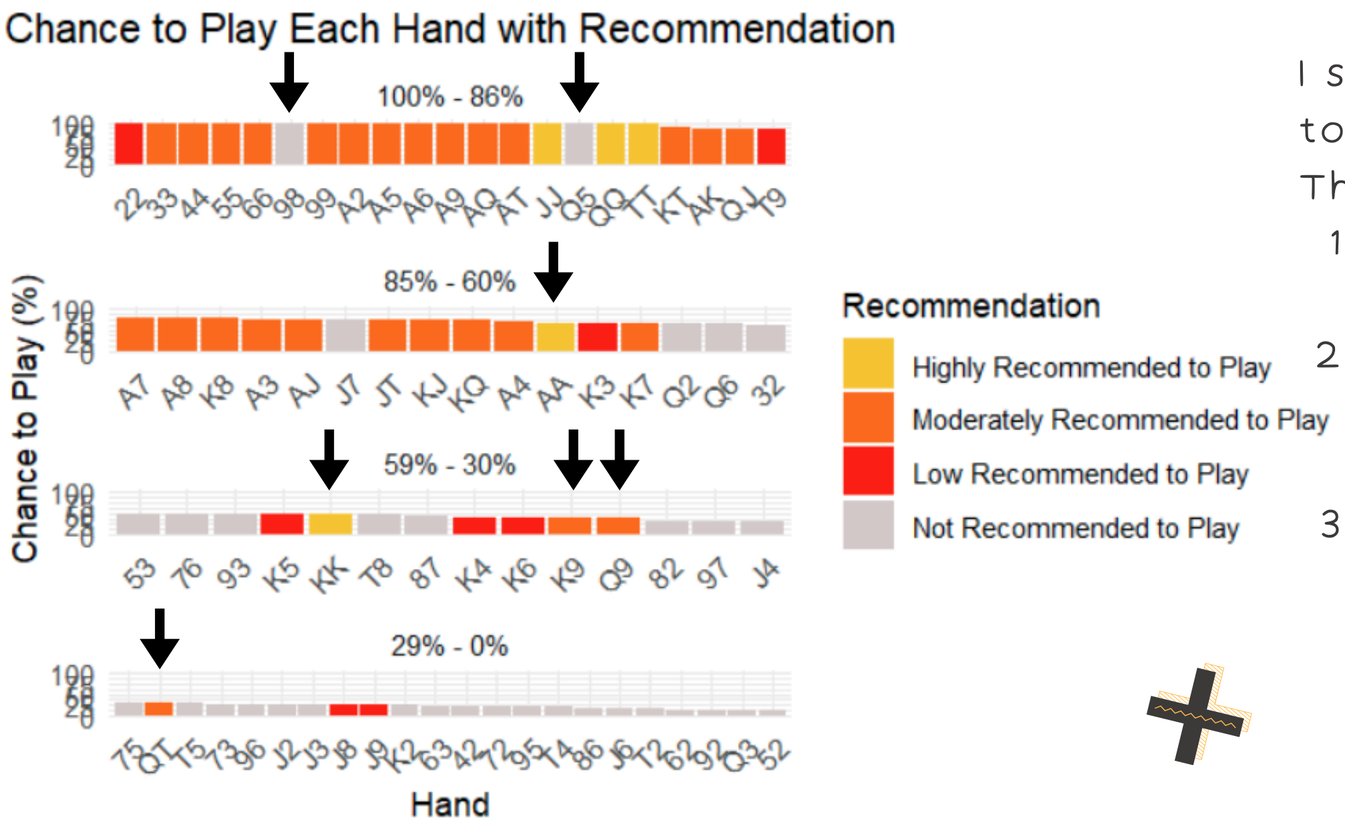
This plot shows my chances of playing each type of hand. How can I determine if my decisions to play these hands are correct?

Adding GTO PreFlop WinRate



I extracted the PreFlop WinRate from tables on the website, BetandBeat.com.
Which will help me better analyze my gameplay with GTO.

Highlight my gameplay with PreFlop WinRate



Observation:

I set thresholds for PreFlop WinRate to indicate GTO recommendations. This plot reveals several issues:

1. AA and KK have low play rates despite being the top hands.
2. Some non-recommended hands have very high play rates (100% in the current dataset).
3. Some recommended hands (K9, QT, Q9) show low play rates.

Analyzing the issues

The first issue is straightforward: we should consistently play the strongest hands in poker to maximize our chances of winning.

Now, let's examine Issue 2:

Why do I tend to play hands like 98 and Q5, even though they are not recommended?

1 Result of playing hand 98

Name <chr>	Total_Played <int>	Wins <int>	WinRate <dbl>	WinRate_x2 <dbl>	WinRate_x3 <dbl>
Hand_98_analysis	6	0	0	46.8	32

Observation:

I consistently find that playing the hand 98 results in losses.

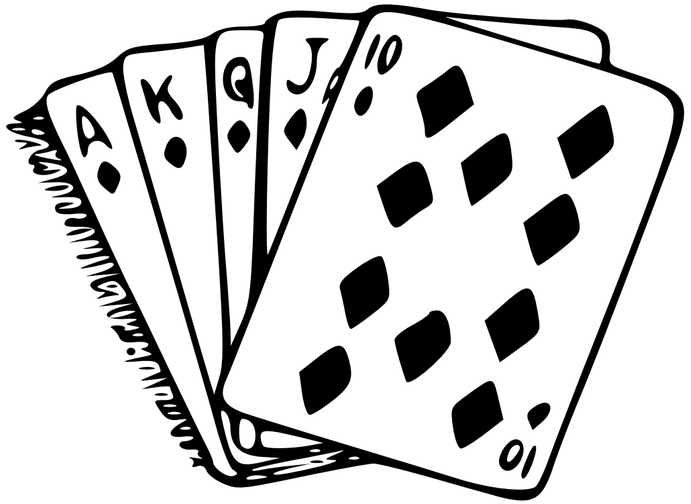
2 Reason why playing 98

Date <date>	Hand <chr>	Suit.Not.Suit <chr>	Actions <chr>
2025-03-13	98	s	raise30_raise30_call50
2025-03-14	98	s	call6_fold
2025-03-14	98	s	call4_call12_fold
2025-03-14	98	s	call6_fold
2025-03-18	98	o	call6_check_fold
2025-03-19	98	s	bet6_check_check_call6

Observation:

Most of the time, these hands are suited, as I often aim to complete a flush or a straight.

Should we always aim for a straight or a flush?

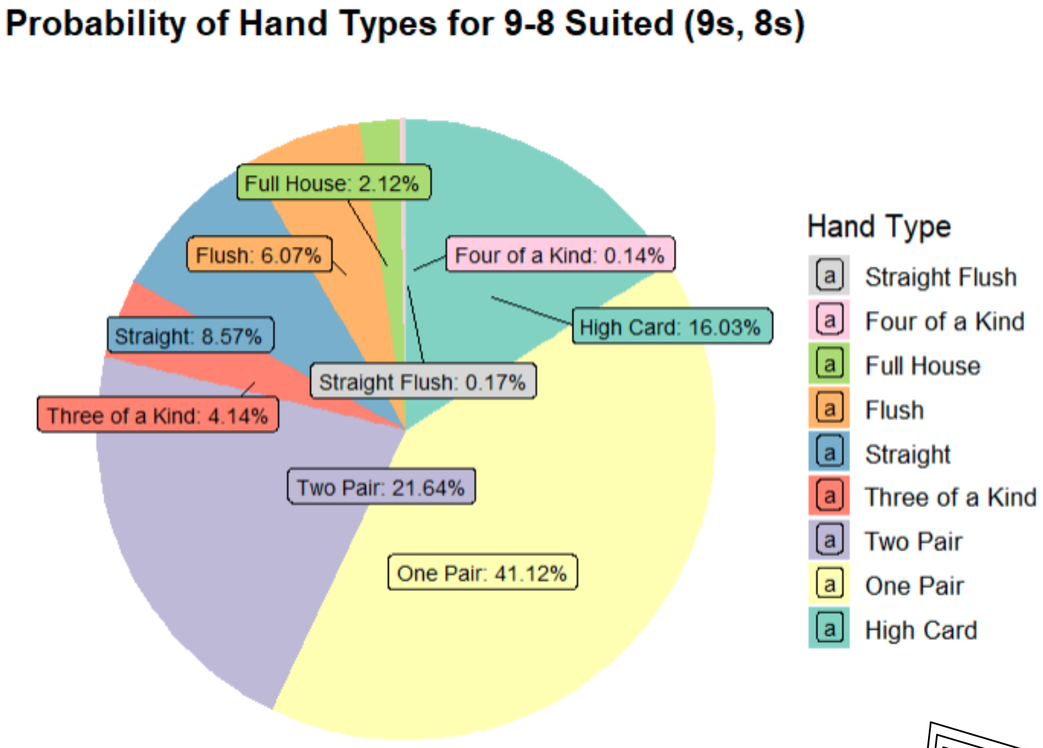


1 Find out the Probability

I use the "poker" package to calculate the probability of getting a flush or straight with 98s.

```
Hand: 9s, 8s
Simulations: 10000
High Card probability: 0.1603 (16.03%)
One Pair probability: 0.4112 (41.12%)
Two Pair probability: 0.2164 (21.64%)
Three of a Kind probability: 0.0414 (4.14%)
Straight probability: 0.0857 (8.57%)
Flush probability: 0.0607 (6.07%)
Full House probability: 0.0212 (2.12%)
Four of a Kind probability: 0.0014 (0.14%)
Straight Flush probability: 0.0017 (0.17%)
```

2 Visualize the result



3 Reflection from the result

With 98s, the probabilities are:

- 62.74% for at least one pair (not necessarily 8s or 9s)
- 8.57% for a straight
- 6.07% for a flush

A flush of 9 is too weak. Thus, I shouldn't play 98s because:

1. A pair of 9 is small.
2. A flush of 9 is small.
3. Only 14.6% chance to get a straight or flush, similar to other suited consecutive cards.

There is similar result for hand Q5

```
# Display the summary results
print(summary_results)
```

A tibble: 1 x 7

Total_Played <int>	Wins <int>	WinRate_x2 <dbl>	WinRate_x3 <dbl>	WinAgainst_x2_Count <int>	WinAgainst_x3_Count <int>	WinRate <dbl>
5	0	48.6	30.3	0	0	0

1 row

```{r}
hand_Q5_analysis
```

A tibble: 5 x 17

Date <date>	Hand <chr>	Suit.Not.Suit <chr>	Actions <chr>	NumberOfAction <int>	Position <chr>	MyAsset <int>	Is_Bust <lgl>	New_Session <lgl>
2025-03-14	Q5	s	call2_fold	2	-3	738	FALSE	FALSE
2025-03-18	Q5	s	call6_fold	2	S	281	FALSE	FALSE
2025-03-19	Q5	o	check_fold	2	B	98	FALSE	FALSE
2025-03-19	Q5	o	call4_fold	2	B	216	FALSE	FALSE
2025-04-10	Q5	o	bet6_call10_bet50	3	-3	142	FALSE	FALSE

5 rows | 1-9 of 17 columns

I play off-suit hands more often than suited hands, which reduces my chances of getting a flush. With Q5, there's no potential for a straight. Therefore, I should avoid this hand to optimize expected value.

How about issue3?

1 Result of playing hand QT

Name <chr>	Total_Played <int>	Wins <int>	WinRate <dbl>	WinRate_x2 <dbl>
Hand_QT_analysis	2	0	0	56.5

Observation:

I consistently find that playing the hand QT results in losses.

2 Reasons for Losing with QT Despite a High Pre-Flop Win Rate

Date <date>	Hand <chr>	Suit.Not.Suit <chr>	Actions <chr>
2025-03-21	QT	o	call6_fold
2025-03-21	QT	s	call22_fold

Observation:

I consistently fold this hand before the flop because I believe my strategy leads to losing with it.

Adopting a tight strategy

In 19/03, I choose to implement a very tight strategy, playing only the following hands:

1. Pocket pairs

   e.g., 44, 55

2. Ax hands

   excluding A6 and A7, e.g., A5, A9, AT

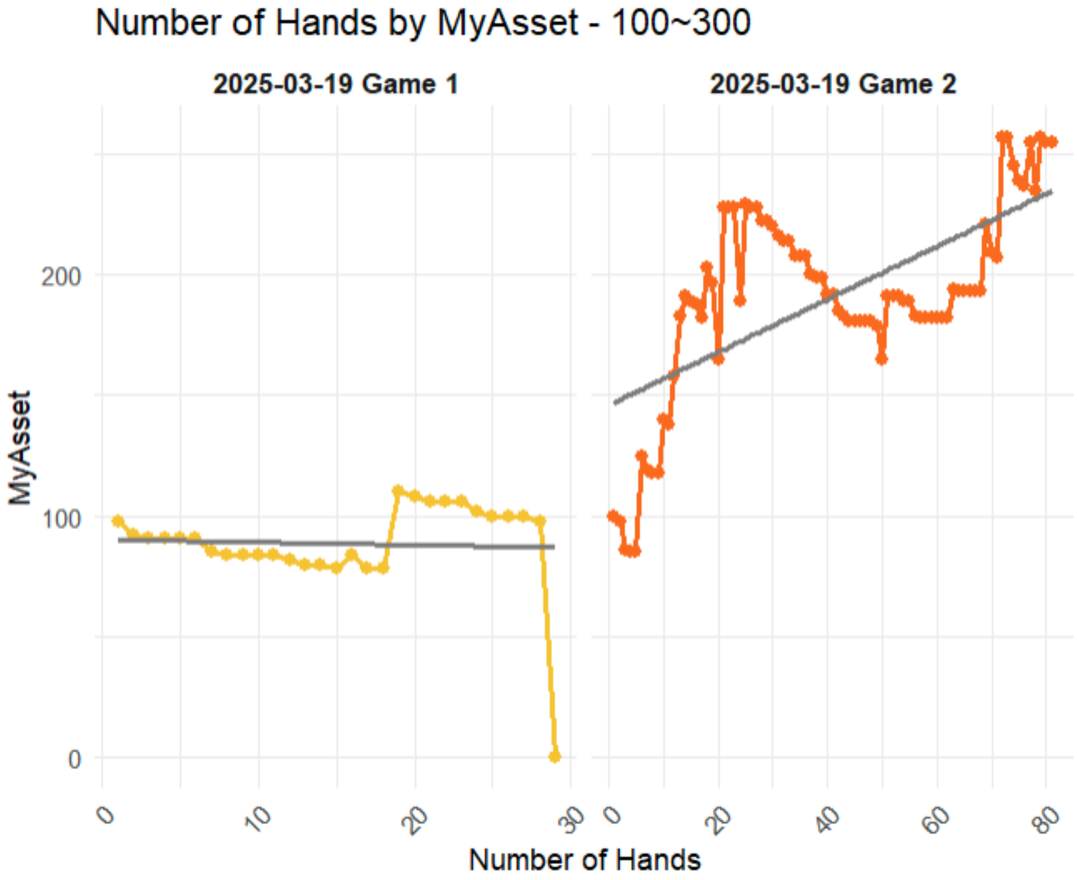
3. Two high cards

   e.g., QT, KJ

Expected Outcome:

To see if the win rate of a tight strategy is higher.

Pattern Analysis



Observation:

Both games feature more than 20 hands, providing enough data to assess performance over the session.

In Game 1, although I lost an all-in at the end, it can be attributed to bad luck, as even AA can lose. Despite this final hand, Game 1 shows an overall increasing trend in performance.

In Game 2, the winning streak is evident, even surpassing the value lost in Game 1.

WinRate & PlayerType

1 WinRate

Win rate of all time: 32.98429 %

After analyzing, I found that my win rate for the hands I entered the pot is approximately 33%. This is not optimistic, especially considering that Q7, which has the lowest recommended win rate by GTO, has a 50% chance of winning pre-flop. I believe this is due to my loose play style.

2 Actions that I take

It's clear that I tend to raise more than check, indicating that I am an aggressive player.

action_list <fctr>	count <int>	proportion <dbl>
raise	160	0.2925046
check	79	0.1444241
fold	308	0.5630713

3 Analysis PlayerType

I believe that 416 hands of poker provide sufficient data for a preliminary analysis of my playing style.
Based on the conclusions drawn, I am confident that my analysis is accurate, indicating that I am a loose aggressive player.

```
Action Counts and Proportions:

Total Hands: 416
Aggression (Raises / Non-Fold Actions): 0.669
Looseness (Hands with Actions / Total Hands): 0.459
Player Type: Loose Aggressive
```

Conclusion

1 Win Rate

I experienced a lower win rate (33%) than expected (50%) during the previous games.

2 Type of Player

I am a loose aggresive player

3 GTO

I believe that GTO can help enhance my performance in poKer, as the game is more about expected value than luck.

4 BreaK the myth

Drawing a flush or straight isn't very liKely, so I should avoid playing lower consecutive hands in the future.

Limitation

Comprehensiveness

The poKer game is moving quicKly, and I don't have enough time to jot down all the information at the table, such as who bet, the amount they bet, and the public cards.

LacK Of Resource

The GTO database is extensive and heavily influenced by various factors, such as betting size and position. Unfortunately, I lacK the resources to perform the necessary calculations. Additionally, there aren't many free online resources available. As a result, I can only analyze using pre-flop win rates. While GTO strategies rely on these rates for decision-maKing, they also vary based on position and betting size.

Thank You!