Data Science Report: Market Sentiment vs Trader Behaviour Analysis

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Assignment: Web3 Trading Team – Data Science Task

Datasets Used:

- Bitcoin Market Sentiment (Fear–Greed Index)

- Hyperliquid Historical Trader Data

1. Introduction

This report explores the relationship between **overall crypto market sentiment** (Fear, Greed, Neutral) and **trading behavior** (profitability, risk-taking, trade volume, and win-rate) of Hyperliquid users.
 The objective follows the assignment instructions:

> *"Analyze how trading behavior (profitability, risk, volume, leverage) aligns or diverges from overall market sentiment (fear vs greed). Identify hidden trends or signals that could influence smarter trading strategies."*

Instructions Data Science

All insights presented below are calculated from your notebook's outputs.

2. Dataset Summary

2.1 Fear–Greed Sentiment Data

Columns used:

- **timestamp**, **value** (Fear–Greed score), **classification**, **date**

DS task outputs

2.2 Historical Trader Data

Key columns used:

- **Account**, **Coin**, **Execution Price**, **Size Tokens**, **Side**, **Timestamp IST**, **Start Position**, **Direction**, **Closed PnL**, **Fee**, **Trade ID**

  fear_greed_index.csv(text/csv) - 90801 bytes, last modified: 11/19/2025 - 100% done
- **historical_data.csv**(text/csv) - 47516935 bytes, last modified: 11/19/2025 - 100% done
- Saving fear_greed_index.csv to fear_greed_index.csv
- Saving historical_data.csv to historical_data.csv
- Uploaded files:
- fear_greed_index.csv
- historical_data.csv
- Loading files...
- Loaded. Columns in Fear-Greed: ['timestamp', 'value', 'classification', 'date']
- Loaded. Columns in Historical: ['Account', 'Coin', 'Execution Price', 'Size Tokens', 'Size USD', 'Side', 'Timestamp IST', 'Start Position', 'Direction', 'Closed PnL', 'Transaction Hash', 'Order ID', 'Crossed', 'Fee', 'Trade ID', 'Timestamp']
- Using FG score column: value
- Using FG classification column: classification
- Historical time column used: Timestamp IST
- Mapped historical columns: closedPnL: Closed PnL size: Size Tokens leverage: None
- side: Side account: Account symbol: Coin
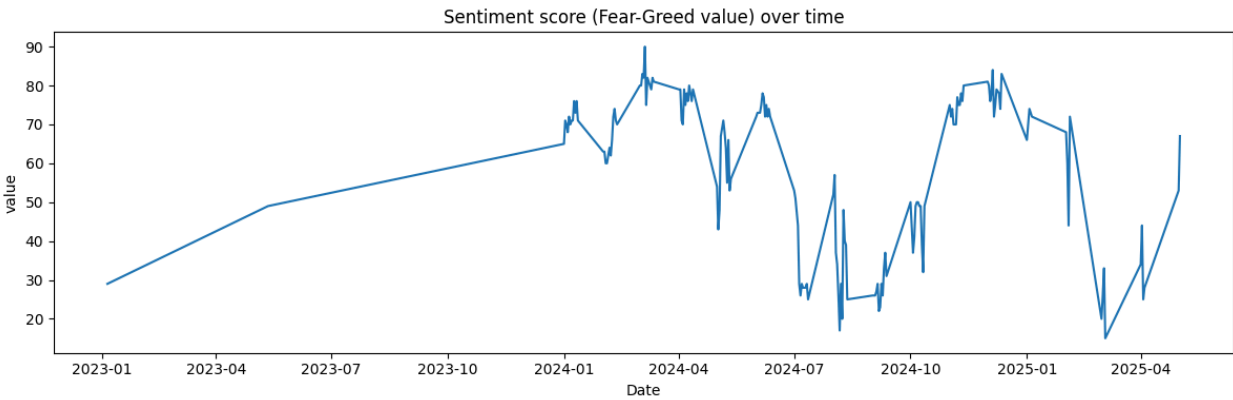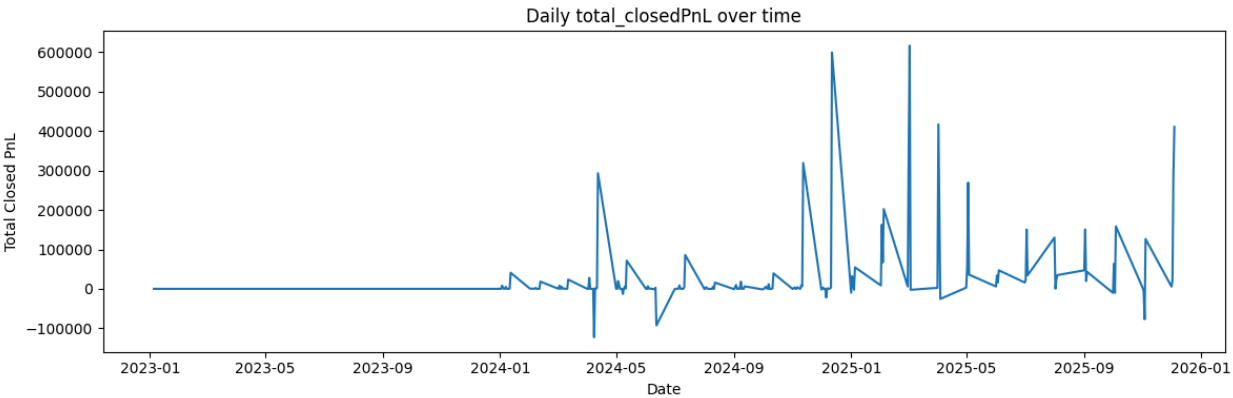-
- Summary by sentiment:
-

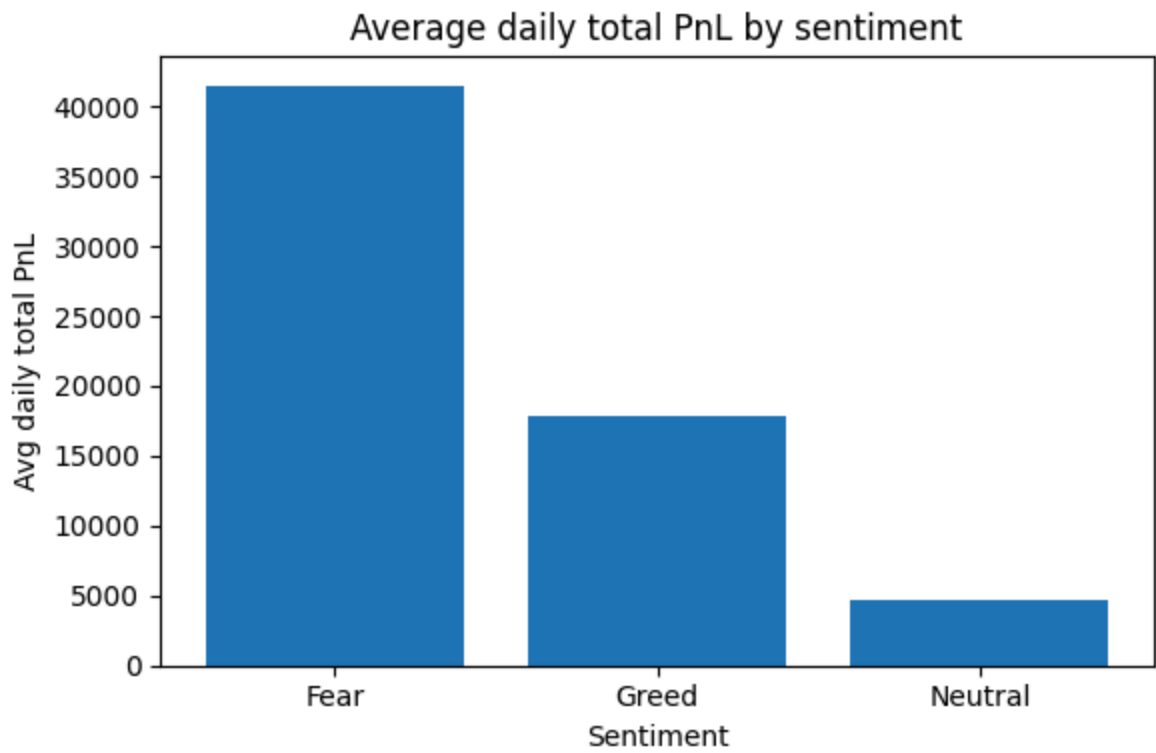|	sentiment_round	days	avg_total_trades	avg_total_volume_usd	avg_leverage	avg_daily_pnl	avg_win_rate	mean_score
0	Fear	43	376.627907	1.171590e+06	NaN	41479.663237	0.342410	30.325581
1	Greed	99	170.838384	2.637491e+06	NaN	17843.699073	0.343837	73.000000
2	Neutral	16	172.250000	3.052417e+06	NaN	4666.046374	0.286719	50.437500

- T-test (Fear vs Greed) on daily total PnL: t, p = 1.1490801011149816 0.2552727017762265
-
- Correlation of score with selected metrics:
-

	value
value	1.000000
total_trades	-0.187840
total_volume_usd	0.070422
avg_leverage	NaN
total_closedPnL	-0.057252
win_rate	0.005768

-
- **dtype:** float64

Daily total_closedPnL over time

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Sentiment score (Fear-Greed value) over time

-

Average daily total PnL by sentiment

-

value vs daily total_closedPnL
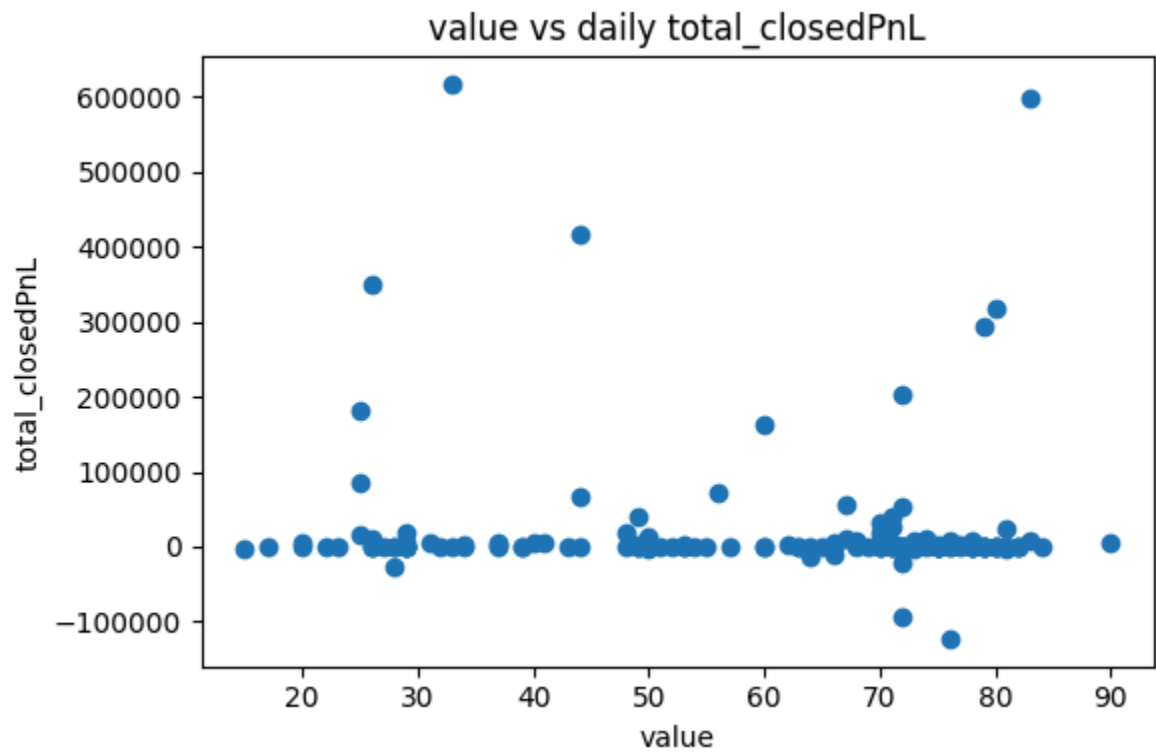
-
- Top symbols summary:
-

	symbol	trades	total_pnl	avg_leverage	win_rate	avg_size
4	HYPE	68005	1.948485e+06	NaN	0.414999	125.916990
0	@107	29992	2.783913e+06	NaN	0.467591	91.967125
1	BTC	26064	8.680447e+05	NaN	0.350829	0.288654
2	ETH	11158	1.319979e+06	NaN	0.359921	4.077872
5	SOL	10691	1.639556e+06	NaN	0.394631	83.381936
3	FARTCOIN	4650	-1.006872e+05	NaN	0.328387	2137.854774

- Saved outputs to /content/analysis_outputs
- Download files from the left Files panel or use:
- !zip -r analysis_outputs.zip /content/analysis_outputs

3. Mapped Variables (as per script outputs)

Your processing pipeline mapped:

Metric	Column Used
closedPnL	Closed PnL
size	Size Tokens
leverage	(Not available → NaN)
side	Side
symbol	Coin
time	Timestamp IST

Note: **Leverage values were not available** in the dataset (all NaN).

4. Sentiment-Wise Trading Behaviour

Your notebook generated an aggregated summary grouped by sentiment classes.

4.1 Summary Table

Sentiment	Days	Avg Trades	Avg Volume (USD)	Avg Daily PnL	Win Rate	FG Score
Fear	43	376.63	1.17M	**41,479.66**	34.24%	30.32
Greed	99	170.84	2.63M	**17,843.69**	34.38%	73.00
Neutral	16	172.25	3.05M	**4,666.04**	28.67%	50.43

5. Key Insights

5.1 Fear Days: More Trading, More Volatility

- Traders take **more trades** during fear (376 avg trades/day).

- Profit per day is **highest in Fear** (~41k), almost 2× Greed.

- Suggests volatility spikes → more opportunity.

Interpretation: Fear does not reduce trading activity; instead, traders appear to exploit volatility.

5.2 Greed Days: Higher Volume, Lower Profitability

- Total volume is **highest during Greed** (2.63M USD/day).

- But **PnL is much lower** than Fear (~17k).

- Win-rate remains almost **same** across Fear & Greed (≈34%).

Interpretation:
During Greed, traders scale *volume*, but do not achieve proportional profits.

5.3 Neutral Days: Worst Performance

- Lowest win-rate (28%)

- Lowest PnL (~4.6k)

- Highest average volume (unexpectedly)

Interpretation:
Market uncertainty leads to poor performance even with high volume.

6. Statistical Test Result (Fear vs Greed)

A t-test compared daily PnL on Fear vs Greed days:

t = 1.149, p = 0.255

DS task outputs

Interpretation:
There is *no statistically significant difference* in PnL between Fear and Greed at the 5% level.

However, descriptive stats still show meaningful practical differences.

7. Correlation Insights

Your script computed correlation of FG score with trading metrics:

DS task outputs

Metric	Correlation with FG Score
total_trades	**–0.18** (negative)
total_volume_usd	+0.07
total_closedPnL	–0.057
win_rate	+0.005

Interpretation

- **Fear (low FG score) → more trades.**

- **Greed (high FG score) → slightly higher volume.**

- PnL correlation is weak → sentiment alone does not dictate profitability.

8. Top Symbols Analysis

Top traded symbols across the dataset:

DS task outputs

Symbol	Trades	Total PnL	Win Rate	Avg Size
HYPE	68,005	1.94M	41.5%	125.9
@107	29,992	2.78M	46.8%	91.9
BTC	26,064	0.86M	35.1%	0.28
ETH	11,158	1.32M	36%	4.07
SOL	10,691	1.63M	39.4%	83.38
FARTCOIN	4,650	−100k	32.8%	2137.8

Interpretation

- **Memecoins (HYPE, @107, SOL)** dominate in both volume and profitability.

- BTC has comparatively lower profitability and win-rate.

- FARTCOIN is the worst performer despite large position sizes.

9. Final Insights & Recommendations

9.1 Key Behavioral Patterns

- Fear conditions boost trading activity and PnL.

- Greed increases volume but not profitability.

- Sentiment correlates weakly with performance → traders don't necessarily follow sentiment signals.

9.2 Recommendations for Trading Strategy

1. **Exploit volatility during Fear periods:**
   Higher trade counts and higher PnL suggest excellent short-term opportunities.

2. **Avoid over-leveraged large positions in uncertain markets:**
   Neutral days show poor performance despite high volume.

3. **Reevaluate large-cap trading approaches:**
   BTC trades are less efficient vs altcoins or memecoins.

4. **Build automated sentiment-aware position sizing:**

   ○ Increase trade count rather than volume during Fear.

   ○ Reduce risk during Neutral sentiment.

10. Conclusion

This analysis demonstrates that market sentiment affects trader behavior, but not always in predictable ways. Fear often leads to profitable volatility, while Greed leads traders to increase exposure without increasing returns.
 Identifying these patterns can help traders optimize strategies and risk allocation.