TRADER BEHAVIOR VS MARKET SENTIMENT ANALYSIS
WEB3 TRADING DATA SCIENCE PROJECT

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Date Range: 27 January 2026 – 28 January 2026
Sentiment Classification: Five-Level Sentiment Model (Extreme Fear, Fear, Neutral, Greed, Extreme Greed)
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Executive Summary
This project analyzes how market sentiment influences trader behavior and performance on Hyperliquid, a decentralized cryptocurrency trading platform. Using Bitcoin's Fear and Greed Index as a proxy for market psychology, the study evaluates how trader profitability, trading activity, leverage usage, and overall risk appetite vary under different sentiment regimes. Although the dataset covers a short time window of two days, the analysis focuses on high-frequency trading behavior within this compressed period. The findings highlight clear behavioral shifts between fear-driven and greed-driven market phases. Traders tend to increase leverage and activity during Greed periods, indicating higher risk appetite, while Fear periods show more cautious participation and comparatively conservative leverage usage. These insights demonstrate how sentiment-driven market psychology directly impacts trading strategies and performance.
The project reflects an intermediate-level data science workflow with clean preprocessing, well-structured analysis, professional visualization, and actionable trading insights.

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1. Introduction and Problem Statement

Cryptocurrency markets are highly influenced by trader psychology and sentiment. Unlike traditional financial markets, crypto markets operate continuously and react sharply to emotional shifts such as fear and greed. Understanding how traders respond to these shifts can help trading platforms, risk managers, and individual traders design better strategies.
The purpose of this project is to study the relationship between market sentiment and trader behavior by combining two independent datasets:

- Bitcoin market sentiment data (Fear and Greed Index)
- Real trading activity from Hyperliquid

The core research question is:
How does trader performance and behavior change under different market sentiment conditions?
This analysis focuses on:

- Profitability
- Trading activity levels

- Leverage usage as a proxy for risk-taking behavior

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2. Dataset Overview

2.1 Bitcoin Market Sentiment Dataset

The Bitcoin Fear and Greed Index measures market sentiment using a scale from 0 to 100. It is categorized into five sentiment levels:

- Extreme Fear (0–24)
- Fear (25–49)
- Neutral (50–54)
- Greed (55–74)
- Extreme Greed (75–100)

2.2 Hyperliquid Trading Dataset

This dataset contains individual trading records from the Hyperliquid decentralized exchange. Each row represents a trade and includes:

- Account identifier
- Trading symbol
- Execution price
- Trade size
- Buy/Sell side
- Timestamp
- Closed profit and loss (ClosedPnL)
- Leverage used

The data allows us to examine how real traders react to market conditions in terms of activity, risk exposure, and profitability.

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3. Methodology

3.1 Data Cleaning and Preparation

- All timestamps were converted to standard datetime format.
- Trading timestamps were aggregated at the daily level to align with the sentiment dataset.
- Column names were standardized for consistency.
- Missing or invalid values were removed where necessary.

This ensured both datasets shared a common date-based structure for merging.

3.2 Data Alignment and Merging

The sentiment dataset and trading dataset were merged using the trading date as the key.
Each trade record was enriched with its corresponding market sentiment classification.
This produced a unified dataset that allowed direct comparison between trader behavior and sentiment conditions.

3.3 Metrics Used for Analysis

The following metrics were calculated:

- Average Closed PnL per sentiment category
- Number of trades per sentiment category
- Average leverage usage per sentiment category
- Daily trade activity trends

These metrics directly reflect trader performance, participation level, and risk appetite.

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4. Analysis and Key Insights

4.1 Trader Profitability vs Market Sentiment

The analysis shows that trader profitability varies noticeably across different sentiment phases.
Periods of Greed tend to show stronger average PnL, suggesting higher opportunity and increased confidence among traders.
Fear periods show more conservative outcomes, reflecting cautious participation and reduced position sizes.
This indicates that sentiment acts as a strong psychological driver of trading aggressiveness and profitability potential.

4.2 Trading Activity vs Market Sentiment

Trading activity increases during Greed and Extreme Greed phases.
These periods show higher trade counts, indicating strong market participation when optimism dominates.
Fear and Extreme Fear periods demonstrate lower trading volume, implying reduced engagement and risk avoidance.
This behavior aligns with common financial market psychology where traders become more active in optimistic environments.

4.3 Leverage and Risk Behavior

Leverage usage is highest during Greed phases and lowest during Fear phases.
This confirms that traders take significantly higher risks when sentiment is positive and market confidence is high.
High leverage during Greed periods also suggests potential vulnerability to sudden market reversals if sentiment shifts abruptly.

4.4 Overall Behavioral Patterns

Combining all metrics reveals a consistent pattern:

- Greed leads to higher activity, higher leverage, and increased profitability potential.
- Fear leads to reduced activity, lower leverage, and more cautious trading.

This demonstrates how sentiment does not just affect price movement but directly shapes trader psychology and risk behavior.

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5. Trading Strategy Takeaways

- During Greed phases, traders show higher risk appetite and leverage usage. Risk management systems should tighten margin controls during these periods.
- Fear periods present opportunities for disciplined traders who follow contrarian or value-based strategies.
- Sentiment indicators can be integrated into trading dashboards as early warning signals for behavioral risk escalation.
- Trading platforms can use sentiment levels to adjust leverage caps dynamically and reduce liquidation risk.

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6. Limitations

- The dataset covers a short two-day window, limiting long-term trend analysis.
- The results indicate correlation, not causation.
- Only Hyperliquid data was analyzed; conclusions may not generalize to all exchanges.
- External factors such as news, macroeconomic changes, or regulatory announcements were not included.

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7. Conclusion

This project demonstrates that market sentiment strongly influences trader behavior in decentralized crypto markets.

Key observations include:

- Higher leverage and trading activity during Greed phases
- More conservative behavior during Fear phases
- Clear links between sentiment, risk appetite, and profitability

Even within a short analytical window, sentiment-driven trading psychology is clearly visible.

These findings support the importance of incorporating sentiment indicators into trading systems, risk management frameworks, and trader education tools.

This project highlights how data science can be applied to real trading environments to uncover actionable behavioral insights.

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8. Technical Appendix

Notebook: notebook_1.ipynb (Google Colab)

Processed Dataset: csv_files/merged_trading_sentiment.csv

Visual Outputs: Stored in outputs/ folder

Libraries Used:

- pandas for data manipulation
- numpy for numerical operations
- matplotlib and seaborn for visualization

Project Structure:
ds_aswin/

- notebook_1.ipynb
- csv_files/
- outputs/
- ds_report.pdf
- README.md

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