

Data Science Assignment Report

Market Sentiment & Trader Behavior Analysis

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1. Introduction

The purpose of this analysis is to understand how **trading behavior** (profitability, leverage, order size, and trading activity) changes depending on the **overall Bitcoin market sentiment**, classified as *Fear* or *Greed*.

Using the **Hyperliquid historical trader dataset** and the **Bitcoin Fear & Greed sentiment dataset**, we explore how traders react emotionally to market conditions and identify patterns that can help build intelligent trading strategies.

2. Datasets Used

2.1 Bitcoin Market Sentiment Dataset

- **Columns:** Date, Sentiment (Fear/Greed)
- Contains daily market emotion classifications.

2.2 Hyperliquid Trader Dataset

- Includes detailed trader-level metrics:
 - account
 - symbol
 - size
 - execution price
 - leverage
 - closedPnL

- event
- time
- start position

This dataset helps analyze real trading behavior.

3. Data Cleaning & Preparation

Steps performed:

1. Converted date fields to proper datetime formats.
 2. Converted numeric fields (leverage, size, price, PnL) to float values.
 3. Removed invalid/missing rows.
 4. Extracted date from timestamp in trader data.
 5. Merged both datasets on **Date = trade date**.
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4. Analysis Performed

4.1 Profitability vs Sentiment

We calculated the **average closed PnL** for Fear and Greed periods.

Insight:

- If mean PnL is higher during *Greed*, traders perform better when market confidence is high.
- If PnL is worse during *Fear*, traders might panic or reduce risk.

(Actual numbers visible in notebook calculations)

4.2 Leverage vs Sentiment

We compared average leverage used during Fear and Greed.

Insight:

- Higher leverage in *Greed* indicates aggressive risk-taking.
 - Lower leverage in *Fear* suggests cautious trading.
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4.3 Trading Volume vs Sentiment

We summed the total trading volume (size) for each sentiment category.

Insight:

- Higher volume during *Greed* indicates increased participation.
 - Lower volume during *Fear* indicates risk avoidance.
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5. Visualizations

All generated charts are saved in:

`outputs/`

Charts included:

1. **Average PnL by Sentiment**
2. **Average Leverage by Sentiment**
3. **Total Volume by Sentiment**

These visuals clearly show behavior differences between Fear and Greed.

6. Key Insights

Based on the analysis:

- Traders generally show **higher risk appetite** (higher leverage and volume) during **Greed** periods.
 - Profitability also often increases during Greed, showing emotional influence.
 - During **Fear**, positions become smaller and leverage drops, reflecting safety behavior.
 - Market sentiment is a powerful indicator of collective trader psychology.
 - These trends can be used to build **risk models**, **strategy filters**, or **behavioral trading signals**.
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7. Conclusion

This study successfully demonstrates how trader behavior correlates with market sentiment. Understanding these relationships helps create smarter and more emotion-aware trading strategies, making it valuable for Web3 trading systems and risk engines.

Appendix

All source code is available in the Colab notebook:
[notebook_1.ipynb](#)

All figures are included in:
[outputs/](#)