

# Title Page

**Project Title:**

**Trader Behavior vs Market Sentiment Analysis (Bitcoin)**

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**Role:** Junior Data Scientist – Trader Behavior Insights

**Organization:** Bajrangs / PrimeTrade

**Tools Used:** Python, Pandas, NumPy, Matplotlib, SciPy, Google Colab

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## 1. Objective

The objective of this project is to analyze how trader behavior (profitability, risk, trade volume, and performance metrics) aligns or diverges from overall market sentiment (Fear, Greed, Extreme Fear, Extreme Greed). The goal is to uncover hidden trends and generate insights that can drive smarter trading strategies.

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## 2. Datasets Used

### 1. Bitcoin Market Sentiment Dataset

- Columns: Date, Classification (Fear, Greed, Extreme Fear, Extreme Greed)
- Time Period: 2018 to 2025

### 2. Historical Trader Data from Hyperliquid

- Columns: Account, Coin, Execution Price, Size (USD), Side, Timestamp, Start Position, Closed PnL, Fees, etc.
  - Total Trades: 211,000+
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### 3. Data Preprocessing

- Converted timestamps into daily dates
- Merged trader data with sentiment data on daily date
- Removed invalid timestamps
- Aggregated daily metrics:
  - Trade Count
  - Win Rate
  - Average Closed PnL
  - Average Trade Size

Processed files saved as:

- trades\_clean.csv
  - daily\_summary.csv
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### 4. Exploratory Data Analysis (EDA)

The following daily-level metrics were analyzed:

- Daily number of trades
- Daily win rate
- Average closed PnL per day
- Average trade size per day

All visualizations were saved inside the outputs folder.

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## 5. Profitability vs Market Sentiment

A boxplot comparison of average daily PnL across different sentiment regimes showed that Greed and Extreme Greed phases tend to have higher average profits. However, volatility is also higher during these regimes.

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## 6. Risk Analysis (Trade Size as Proxy)

Since explicit leverage values were unavailable, average trade size in USD was used as a proxy for risk exposure.

Findings:

- Traders take larger positions during Greed and Extreme Greed.
  - Fear periods show reduced exposure, indicating capital protection behavior.
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## 7. Advanced Risk Analysis (Volatility & Risk-Adjusted Performance)

Daily PnL volatility (standard deviation of daily PnL) was calculated for each sentiment regime. A Sharpe-like risk-adjusted metric was computed as:

Sharpe-like Ratio = Mean Daily PnL / PnL Volatility

Results showed:

- Greed regimes offer higher profits but at the cost of higher volatility.
  - Fear regimes have lower volatility but also lower profitability.
  - Risk-adjusted returns remain moderate across regimes.
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## 8. Statistical Hypothesis Testing

Mann–Whitney U Tests were performed:

- Fear Days: 91
- Greed/Extreme Greed Days: 307

Results:

- PnL p-value = 0.99
- Win Rate p-value = 0.118

Conclusion:

There is **no statistically significant difference** between Fear and Greed regimes at the 95% confidence level. This indicates that sentiment alone is not a guaranteed edge for profitability.

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## 9. Key Insights

1. Greed regimes show higher profits but also higher volatility.
  2. Traders increase risk exposure during Greed conditions.
  3. Win rate does not significantly improve during Greed periods.
  4. Fear regimes show defensive trading behavior.
  5. Sentiment alone is not sufficient for consistent profitability.
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## 10. Strategic Recommendations

- Combine sentiment signals with technical indicators.
- Adjust position sizing dynamically based on market sentiment.
- Avoid excessive leverage during Extreme Greed.

- Implement volatility-based risk controls.
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## 11. Conclusion

This project demonstrates that while market sentiment influences trader behavior and risk-taking, profitability is governed more by execution strategy and risk management than sentiment alone. Advanced risk metrics confirm the classical risk–return tradeoff in crypto markets.