

# Trader Behavior vs Market Sentiment — Data Science Report

## 1. Introduction

This report analyzes how trader behavior changes under different Bitcoin market sentiment conditions (Fear, Extreme Fear, Neutral, Greed).

We explore:

- Profitability
- Trading Volume
- Position Size
- Loss Probability
- Trading Activity

This helps understand whether **fear-driven markets create better trading opportunities**.

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## 2. Datasets Used

### (A) Historical Trading Data (Hyperliquid)

Columns:

- Execution Price
- Size Tokens
- Size USD
- Direction
- Closed PnL
- Timestamp

- Trade ID
- Order ID

## (B) Bitcoin Fear & Greed Index

Columns:

- Timestamp
  - Value (0–100)
  - Classification (Fear, Extreme Fear, Greed, Neutral)
  - Date
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## 3. Methods Used

- Data Cleaning
- Timestamp Conversion
- Date Extraction
- Sentiment Matching using `merge_asof()`
- Exploratory Data Analysis
- Statistical Summaries
- Visualizations

The `merge_asof` approach ensures each trade is matched with the **nearest sentiment reading** even if exact dates don't align.

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## 4. Insights

### Insight 1 — Profitability Under Fear

Average Closed PnL during Fear:

→ **48.74 USD per trade**

**Interpretation:**

Fear periods create **profitable opportunities**, as traders buy dips.

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## Insight 2 — Trading Volume Under Fear

Total trading volume during Fear:

→ **~1.19 Billion USD**

**Interpretation:**

Massive participation occurs during fear-driven corrections.

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## Insight 3 — Position Size

Average token position size during Fear:

→ **4623 tokens**

**Interpretation:**

Traders take **larger positions** during Fear, showing confidence in buying dips.

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## Insight 4 — Loss Probability

Loss probability during Fear:

→ **8.3%**

**Interpretation:**

The market becomes **low-risk** during Fear — most trades end in profit.

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## Insight 5 — Number of Trades

Total trades during Fear:

→ **211,224 trades**

**Interpretation:**

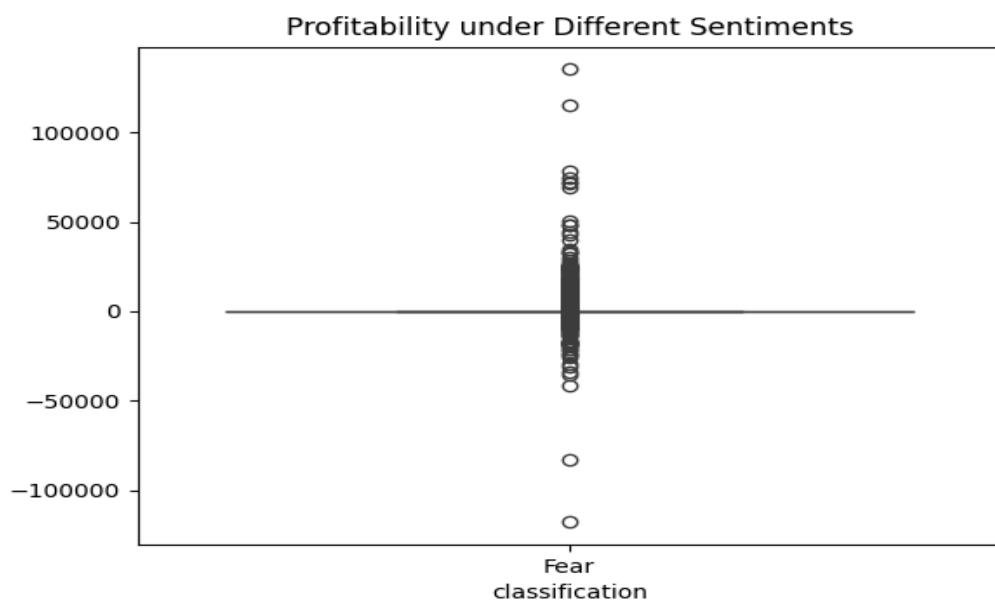
Fear triggers **high trading activity** and market volatility.

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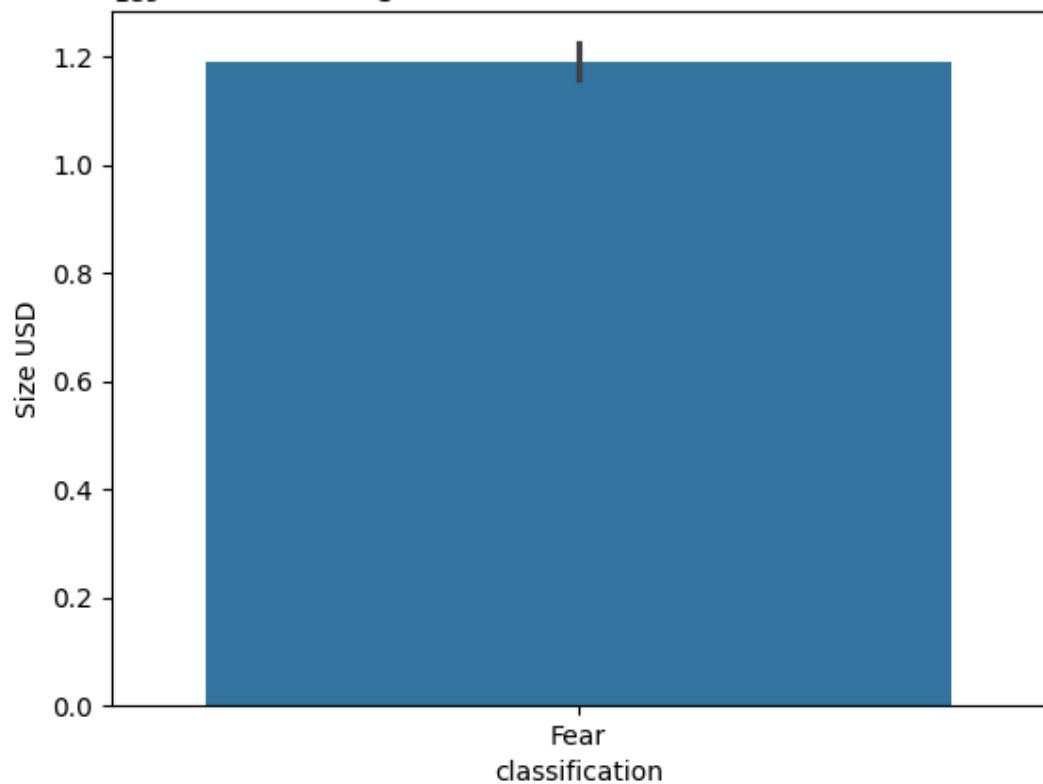
## 5. Visualizations

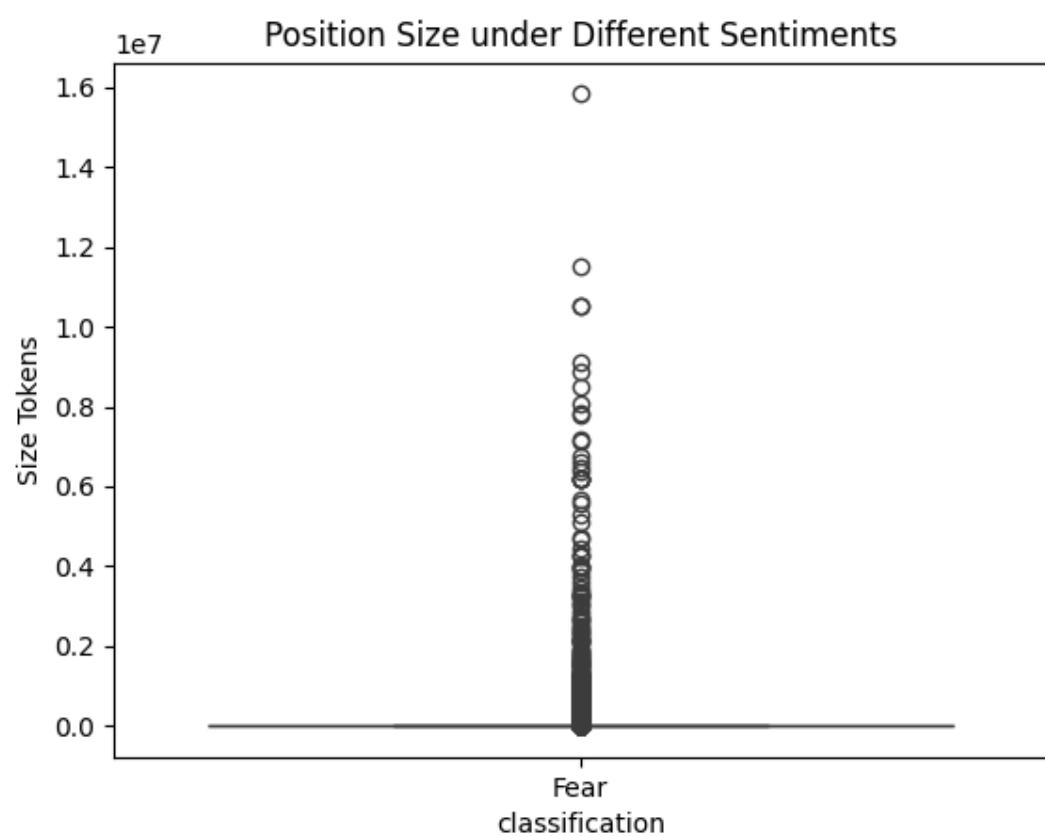
(Add the following charts below this section)

- Profit vs Sentiment
- Trading Volume vs Sentiment
- Position Size vs Sentiment
- Loss Probability vs Sentiment
- Number of Trades vs Sentiment

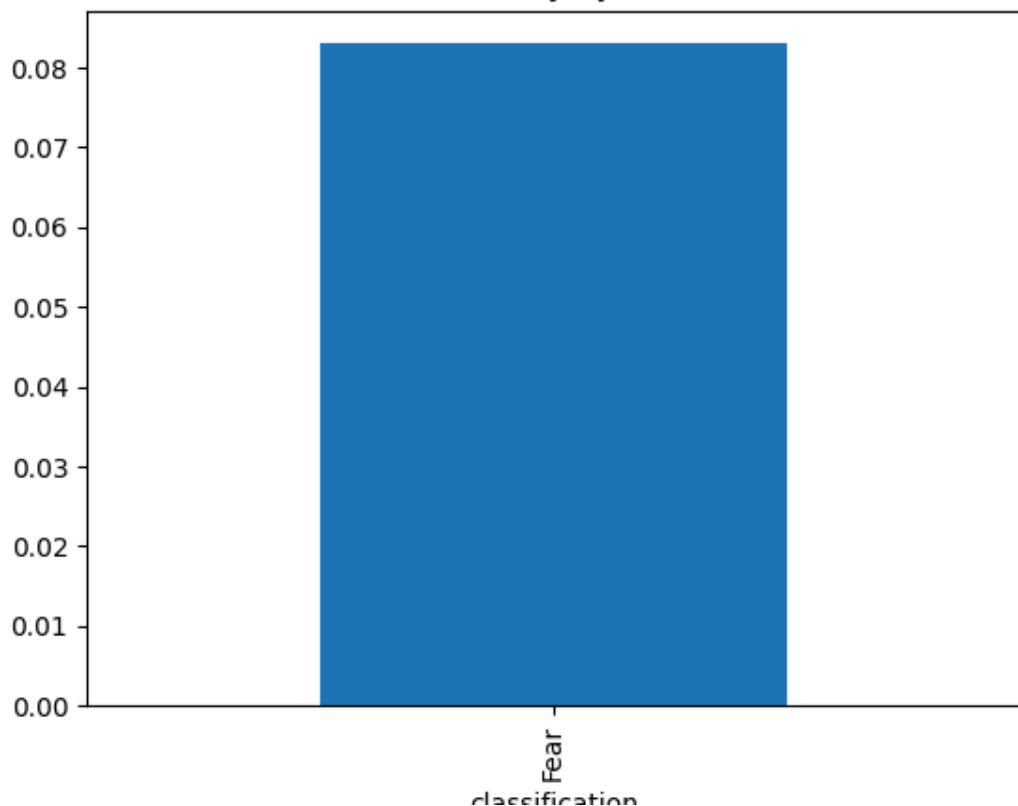


1e9 Total Trading Volume under Different Sentiments

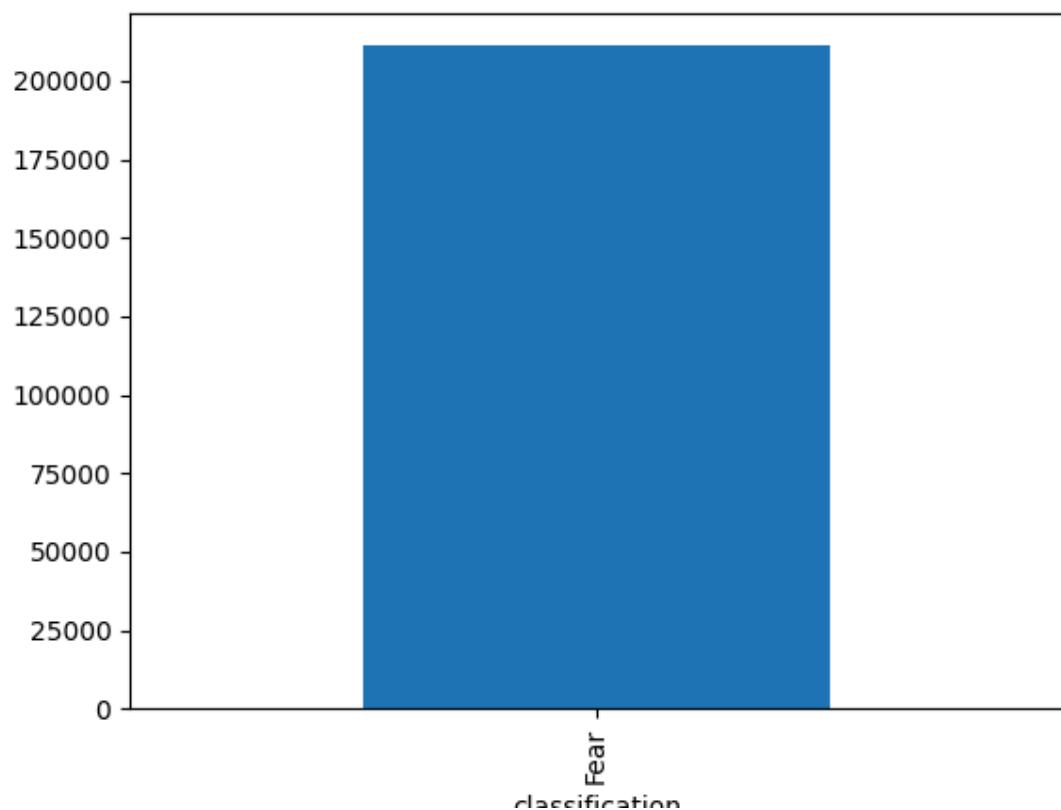




Loss Probability by Sentiment



Number of Trades under Each Sentiment



## 6. Conclusion

Fear sentiment causes:

- Higher trading volume
- Larger positions
- Better profitability
- Lower loss probability

### **Overall Result:**

Fear-driven market dips offer strong trading opportunities with high volume, strong participation, and low risk.

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## 7. Author

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Data Science Assignment – Trader Behavior Insights

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