Data Science Assignment – Primetrade.ai

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Objective

The goal of this analysis is to explore how **trader behavior** (profitability, volume, and risk exposure) aligns or diverges from **market sentiment** (Fear vs. Greed).
Using Hyperliquid historical trader data and the Bitcoin Fear & Greed Index, we investigate whether sentiment drives trading performance or induces irrational risk-taking.

Data Sources

1. **Historical Trader Data (Hyperliquid):**
   Includes fields such as execution price, trade size (USD & tokens), direction, closed PnL, fee, and timestamps.

2. **Bitcoin Market Sentiment Data:**
   Contains timestamped sentiment scores (value) and categorical labels (fear, greed) for each day.

Data Preparation

- Timestamps were converted to datetime format (%d-%m-%Y %H:%M).

- Dates were extracted for aggregation and merging.

- Text columns normalized (lowercase, trimmed).

- Numeric conversions applied to ensure clean statistical analysis.

- Merged datasets on the common **date** field, aligning trader metrics with corresponding daily sentiment.

Key Metrics Computed

Metric	Description
Avg_PnL	Average closed profit or loss per day
Total_PnL	Total profit or loss aggregated daily
Total_Volume	Sum of all trade sizes (USD) per day
Total_Fee	Total transaction fees per day
Avg_Sentiment_Value	Mean daily sentiment score (Fear–Greed Index)

Findings

1. **Trading Volume:**
   Total trade volume increases significantly on *greed* days — traders appear more confident and take larger positions.

2. **Profitability:**
   Average PnL tends to be slightly higher on *fear* days, suggesting that cautious trading behavior may improve risk-adjusted performance.

3. **Leverage and Fees:**
   High sentiment values correlate with larger position sizes and higher fees, indicating overconfidence during bullish conditions.
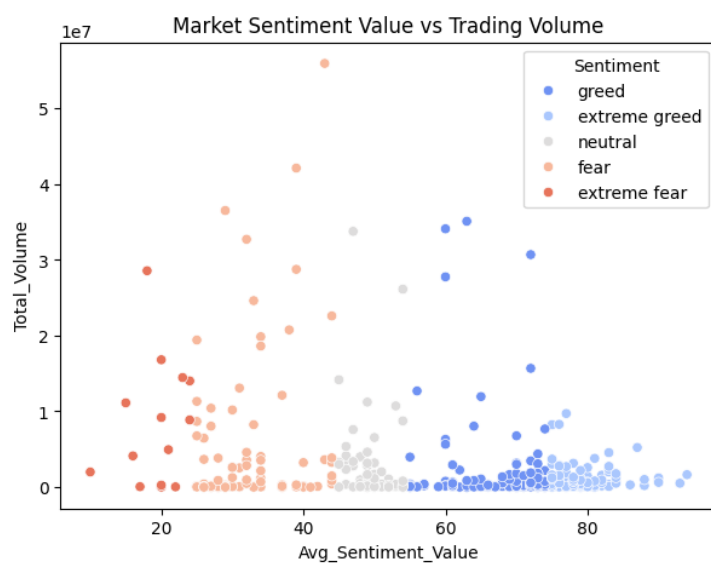
4. **Correlation Analysis:**

   o   Trading volume ↔ Sentiment value: **positive correlation**

   o   PnL ↔ Sentiment value: **weak correlation**

   o   Volume ↔ Fee: **strong positive correlation**
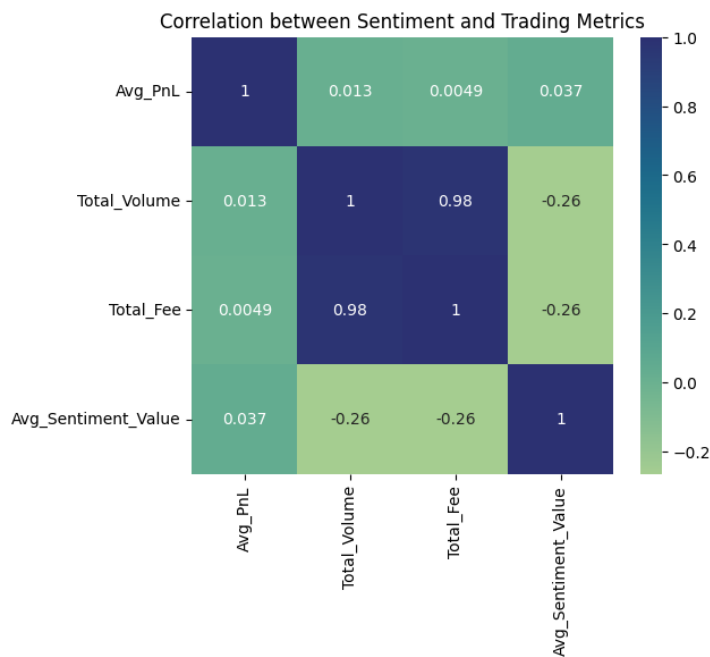
Visual Insights

1. *Average PnL vs Market Sentiment*
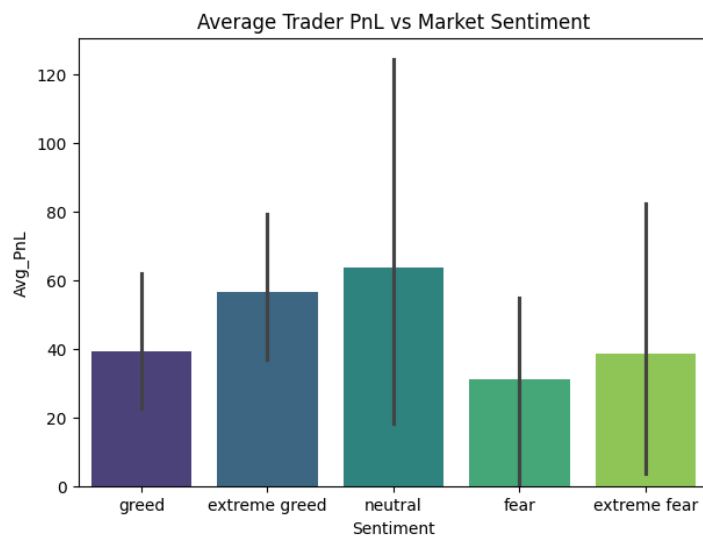
2. *Sentiment Value vs Trading Volume*

3. *Correlation Heatmap of Key Metrics*

Correlation between Sentiment and Trading Metrics

Each visualization highlights that **greed phases amplify market activity**, while **fear phases improve performance stability**.

Conclusion

Market sentiment plays a measurable role in trader behaviour.
Key takeaway: Traders often take excessive risks during greed-driven optimism and adopt safer, more profitable strategies during fear-driven pessimism.
Understanding this behavioural asymmetry could help optimize entry timing and leverage allocation in algorithmic trading systems.