## Trader Behavior vs Market Sentiment – Analysis Report

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Role Applied For: Junior Data Scientist

**Objective**: To analyze how Bitcoin market sentiment influences trader behavior and performance using Hyperliquid historical trading data.

**Datasets Utilized**

1. **Bitcoin Market Sentiment Dataset**
   * Columns: date, classification (e.g., Fear, Greed), value (sentiment score)
2. **Hyperliquid Historical Trader Data**
   * Columns: account, coin, execution price, size, side, timestamp, closedPnL, fee, trade ID, and more

**Data Preparation Workflow**

* Converted Timestamp IST to datetime format and extracted date
* Standardized sentiment dataset’s date column for compatibility
* Merged both datasets on date using a left join
* Validated merge success and identified missing values for further handling

**Exploratory Data Analysis (EDA)**

* Visualized **daily average Closed PnL** to understand performance trends over time
* Created **boxplots** to compare PnL distributions across sentiment classifications
* Calculated **win rate** (trades with positive PnL) for each sentiment category
* Computed sentiment-wise averages for:
  + Closed PnL
  + Size USD
  + Fee

**Advanced Analytical Insights**

**Sentiment Score Bucketing**

* Divided sentiment scores into three buckets: Low (0–30), Medium (30–60), High (60–100)
* Observed that the **Medium sentiment zone** corresponds to more balanced trading behavior

**Correlation Matrix**

* Analyzed relationships between Closed PnL, Fee, Size USD, and Sentiment Score
* Found a **weak negative correlation** between sentiment score and profitability

**Time-of-Day Performance**

* Grouped hourly performance by sentiment classification
* Identified that **early hours during Fear phases** tend to yield better returns

**Coin-wise Sensitivity**

* Compared average PnL across coins and sentiment types
* Highlighted coins that are **more reactive to sentiment shifts**, indicating volatility patterns

**Trader Consistency Across Sentiments**

* Identified top 10 traders with **consistent performance** across all sentiment phases
* These traders may serve as benchmarks for modeling or strategic replication

**Key Takeaways**

* Traders exhibit **higher risk-taking behavior during Extreme Greed**, but win rate declines
* **Fear and Neutral** sentiment phases are associated with more disciplined and profitable trading
* **Fee impact** is significant — higher fees correlate with lower net PnL
* **Time and sentiment together** influence trading outcomes — strategic timing matters
* Certain traders maintain consistent performance regardless of sentiment — valuable for modeling

**Submission Notes**

* The notebook includes all essential steps: data loading, cleaning, merging, EDA, advanced analysis, and insights
* Visualizations are created using **matplotlib** and **seaborn**
* This report summarizes the methodology, findings, and strategic implications of the analysis