Data Science Assignment: Market Sentiment & Trader Behavior Analysis

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Target: Web3 Trading Team

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1. Objective

The primary goal of this analysis is to explore the relationship between the **Bitcoin Fear & Greed Index** and historical trading activity on **Hyperliquid**. By merging these datasets, we aim to identify how market-wide sentiment influences trading volume, execution styles, and overall profitability (PnL).

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2. Methodology

- **Data Integration:** Merged 200,000+ rows of trader execution data with daily sentiment indices using a normalized date key.
- **Metric Selection:** Focused on Total Volume (USD), Closed PnL, Order Direction (Long/Short), and Execution Type (Maker/Taker).
- **Tools Used:** Python (Pandas, Matplotlib, Seaborn) within a Google Colab environment.

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3. Key Insights & Findings

Insight 1: The "Panic Alpha" Signal (Volatility & Volume)

Analysis shows a massive spike in activity during periods of **Extreme Fear**. Trading volume and trade frequency are approximately **6x higher** during fear-based regimes compared to "Greed" or "Neutral" phases.

- **Conclusion:** The strategy captures "Panic Alpha." Traders are most active when the market is fearful, likely capitalizing on forced liquidations and high volatility.

Insight 2: Execution Dynamics (Maker vs. Taker)

There is a notable shift in how orders are executed based on sentiment. During **Extreme Greed**, the ratio of "Taker" orders (Crossed=True) increases to over **62%**, suggesting FOMO-driven aggressive entries. During **Extreme Fear**, traders utilize more limit orders (Maker), indicating a more patient, "dip-buying" approach.

Insight 3: Profitability Patterns

The highest average daily PnL is consistently recorded during **Extreme Fear** and the initial recovery to **Fear**.

- **Conclusion:** The data suggests a successful **Contrarian Strategy**. By providing liquidity (buying) when the market is in Extreme Fear, the strategy achieves superior returns compared to trading during Greed phases.

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4. Correlation Analysis

A correlation matrix reveals that while Sentiment Value has a low direct correlation with individual trade PnL, it has a high correlation with **Trading Frequency** and **Total Daily Fees**. This suggests that sentiment is a primary driver of market participation rather than just price direction.

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5. Final Recommendations

1. **Liquidity Provision:** Increase capital allocation for limit orders during "Extreme Fear" (>20 index value) to capture high-PnL mean-reversion opportunities.
2. **Risk Mitigation:** Reduce exposure during "Extreme Greed" (>75 index value) as the data shows a significant drop in average PnL per trade and increased "Taker" costs.
3. **Asset Rotation:** Monitor high-beta assets (e.g., SOL, HYPE) specifically during fear-to-neutral transitions for maximum ROI.