Final Report – Web3 Trading Data Science Assignment

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1. Introduction

This project explores the relationship between market sentiment (Fear & Greed Index) and trader behavior (profitability, risk, leverage, and volume) using two datasets:

1. Bitcoin Market Sentiment Dataset – contains daily sentiment classifications (Fear, Greed, Extreme Fear, Extreme Greed, Neutral).
2. Historical Trader Data from Hyperliquid – contains execution details of trades including account ID, execution price, trade size, leverage, closed PnL, and timestamps.

The main objective is to analyze whether trader behavior aligns or diverges from the overall market sentiment and to uncover patterns that may inform smarter trading strategies.

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2. Data Preparation

Cleaning Steps

- Column names standardized (lowercase, underscores).
- Timestamps converted into datetime.
- Missing values handled (forward fill for sentiment gaps).
- Sentiment mapped to a numeric scale:
    - Extreme Fear = 0
    - Fear = 25
    - Neutral = 50
    - Greed = 75
    - Extreme Greed = 100

Data Integration

- Trader data was merged with the sentiment dataset on date.
- Final merged dataset: 6.6 million rows, covering trades alongside sentiment classification.

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3. Exploratory Data Analysis (EDA)

3.1 Sentiment Distribution

- Most days fall under Fear and Greed, with fewer in extreme categories.
- Market sentiment shows cyclical behavior between fear and greed.

3.2 Trader Profitability (PnL) vs Sentiment

- Average Closed PnL by Sentiment:
    - Extreme Greed → Highest profitability (~68)
    - Neutral/Fear → Lowest profitability (~34)
- Suggests that bullish extremes benefit traders most, while indecisive markets reduce profitability.

3.3 Trade Volume vs Sentiment

- Daily traded USD volume spikes significantly on Fear days, indicating "whale activity" or panic trading.
- Rolling averages confirm high volatility in volume during sentiment transitions.

3.4 Leverage & Risk

- Preliminary analysis shows leverage tends to increase in Fear phases, but profitability does not improve.
- Indicates higher risk-taking during uncertainty, often without better returns.

3.5 Trader Segmentation

- Top 10 profitable traders show consistent PnL across all sentiment states.
- Average traders perform significantly worse in Neutral/Fear markets, suggesting reliance on strong market direction.

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4. Key Insights

1. Extreme Sentiment = More Profits
    - Traders earn higher profits during Extreme Greed markets.
    - Neutral or Fear phases lead to weak profitability.
2. Volume Signals Market Stress
    - High trade volume occurs during Fear, signaling panic-driven trading.
    - Could serve as an early warning indicator.
3. Leverage Behavior is Risky
    - Traders use more leverage during Fear, but without proportional gains.
    - Suggests poor risk management in uncertain markets.
4. Top Traders Beat the Market

- Unlike average traders, top performers are profitable regardless of sentiment.
- They may use hedging or arbitrage strategies not dependent on market direction.

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5. Conclusion

This analysis shows that market psychology heavily influences trader behavior. Profitability aligns with extreme bullish sentiment, while risk-taking intensifies during fear without payoff.

Implications for trading strategies:

- Monitor sentiment extremes as potential high-profit opportunities.
- Treat spikes in volume during Fear as signals for volatility-driven trades.
- Reduce leverage during uncertain (Neutral/Fear) markets to manage downside risk.
- Learn from top traders' consistency, potentially incorporating advanced risk controls or market-neutral strategies.