Data Science Assignment Report

1. Introduction

The purpose of this assignment is to study how market sentiment affects trader behavior and performance. Market sentiment is represented using the **Bitcoin Fear & Greed Index**, which reflects whether the market is driven by fear or greed.

Trader behavior is analyzed using historical trade data from **Hyperliquid**, which includes information such as profit/loss, trade size, and trade frequency.

The goal is to understand whether emotions like fear and greed influence:

- Trading activity
- Profitability
- Risk
- Decision accuracy

2. Datasets Used

2.1 Bitcoin Fear & Greed Index

This dataset provides daily market sentiment labels such as:

- Extreme Fear
- Fear
- Neutral
- Greed
- Extreme Greed

Each trading day is tagged with one of these sentiment categories.

2.2 Hyperliquid Historical Trader Data

This dataset contains individual trade records, including:

- Trader account
- Trade size (USD)
- Trade direction (Buy/Sell)
- Trade timestamp
- Closed Profit and Loss (PnL)

Each trade represents a real trading action taken by a trader.

3. Data Preparation

To combine both datasets:

- Trade timestamps were converted to dates
- Sentiment data was also converted to the same date format
- Both datasets were merged using the **date** column

This allowed each trade to be associated with the market sentiment on the day it occurred.

Additional features were created:

- A **win flag** to indicate whether a trade was profitable

- Daily aggregation of trades per trader to calculate:

    o Total daily profit

    o Number of trades per day

    o Daily win rate

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4. Analysis and Findings

4.1 Trading Activity vs Market Sentiment

The analysis shows that trading activity changes with sentiment.

- During **Fear and Extreme Fear**, traders tend to place more trades

- During **Greed**, the number of trades is relatively lower

This suggests that fear-driven markets may create more short-term trading opportunities or panic-driven activity.

4.2 Profitability vs Market Sentiment

Average profit varies across different sentiment phases.

- Some sentiment periods show higher average profits

- However, profit values are highly unstable and inconsistent

This indicates that market sentiment alone does not guarantee better profitability.

4.3 Risk Analysis (PnL Volatility)

Risk was measured using **PnL volatility**, which represents how much profits and losses fluctuate.

Key observations:

- **Fear periods show the highest volatility**, meaning profits and losses swing widely

- **Neutral periods are more stable**

- High volatility indicates higher risk and uncertainty

This shows that emotional market conditions significantly increase trading risk.

4.4 Win Rate vs Market Sentiment

Win rate represents how often trades are profitable.

- Win rates remain relatively similar across all sentiment categories

- No sentiment phase clearly improves decision accuracy

This suggests that increased trading during emotional markets does not lead to better trade selection.

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5. Note on Leverage

The provided Hyperliquid dataset does not contain an explicit leverage column.
Due to this limitation, leverage-specific analysis was not performed.

Instead, risk was evaluated using **PnL volatility**, which effectively captures the impact of aggressive trading behavior.

6. Key Insights Summary

- Market sentiment strongly influences **how often traders trade**

- Fear-driven markets are associated with **higher trading activity and higher risk**

- Greed does not significantly improve win rates

- Profitability is inconsistent across all sentiment phases

- Risk increases significantly during emotionally charged market conditions

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7. Business Takeaway

While traders may attempt to take advantage of emotional markets, increased activity does not guarantee better results.

Fear-driven markets are riskier and more volatile, while neutral conditions provide more stable outcomes.

This analysis highlights the importance of **sentiment-aware risk management** when designing smarter trading strategies.

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8. Conclusion

This study demonstrates that trader behavior is influenced by market sentiment, especially in terms of activity and risk.

However, sentiment alone does not improve decision accuracy or profitability.
Traders and trading systems should focus not only on returns but also on managing risk during emotionally driven market conditions.