# Data Science Report: Trader Behavior vs Market Sentiment

Web3 Trading Team – Assignment Submission

## 1. Objective

The objective of this analysis is to study how trader behavior on the Hyperliquid platform aligns or diverges from overall Bitcoin market sentiment, classified as Fear or Greed. The analysis focuses on profitability, risk exposure, leverage usage, and trading volume to identify behavioral patterns and signals that can inform smarter trading strategies.

## 2. Datasets Used

- **Bitcoin Market Sentiment Dataset:** Contains daily sentiment classification (Fear / Greed) mapped by date.
- **Historical Trader Data (Hyperliquid):** Contains trade-level information such as account, symbol, execution price, trade size, side, leverage, and closed PnL.

## 3. Data Preprocessing

- Converted all timestamp columns to datetime format.
- Extracted date values to enable alignment between trading data and sentiment data.
- Removed records with missing closed PnL or leverage values.
- Standardized column naming conventions for consistency.
- Merged datasets on Date to associate each trade with market sentiment.

## 4. Exploratory Data Analysis (EDA)

Multiple exploratory analyses were conducted to compare trader behavior across Fear and Greed periods. Key visualizations were generated and saved in the outputs directory.

- **PnL Distribution:** Compared profitability across Fear and Greed periods using box plots.
- **Leverage Analysis:** Examined leverage usage across different sentiment regimes.
- **Trading Volume:** Analyzed total trading volume aggregated by sentiment.

## 5. Key Findings & Insights

- Trading activity tends to increase during Greed periods, indicating higher market participation.
- Leverage usage is generally higher during Greed phases, suggesting increased risk appetite.
- PnL distributions show higher variance during Greed, reflecting both higher upside and downside risk.
- Fear periods exhibit more conservative behavior with lower volume and moderated leverage.

## 6. Trading Strategy Implications

- Risk management rules should be tightened during Greed phases to control over-leveraging.
- Contrarian strategies may be explored during extreme Fear periods when risk-taking is subdued.
- Sentiment-aware leverage caps could improve long-term risk-adjusted returns.

## 7. Conclusion

This analysis demonstrates a clear relationship between market sentiment and trader behavior in a Web3 trading environment. By incorporating sentiment signals into trading and risk frameworks, traders and platforms can make more informed, data-driven decisions under varying market conditions.

Google Colab notebook link:

https://colab.research.google.com/drive/14E4JTRsSYLROCqcjbV3S9YVVmARfojl1?usp=sharing