# **Data Science Assignment – Trader Behavior Insights**

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 **Dataset:** Bitcoin Market Sentiment & Hyperliquid Trader Data

**1. Objective**

The objective of this analysis is to explore the relationship between **trader behavior** and **market sentiment** (Fear/Greed) in the Bitcoin market. The goal is to uncover patterns that could inform smarter trading strategies.

**2. Data Overview**

**Trader Data (trader\_data.csv):**

* Columns: account, coin, execution\_price, size\_usd, size\_tokens, side, timestamp\_ist, closed\_pnl, direction, crossed, fee, etc.
* Contains individual trade records including profitability, trade size, and side (Buy/Sell).

**Market Sentiment Data (bitcoin\_sentiment.csv):**

* Columns: date, classification, value, timestamp
* classification indicates market sentiment: Fear, Greed, Extreme Fear, Extreme Greed, Neutral

**3. Data Cleaning & Preparation**

* Column names standardized (lowercase, underscores).
* Missing values and duplicates were checked; minimal impact on analysis.
* Trader timestamps converted to datetime, and sentiment dates aligned to trader dates.
* Datasets merged on date to link each trade to the corresponding market sentiment.

**4. Exploratory Analysis**

**Trader Behavior Summary:**

* Total trades: 33,164
* Average trade size: varies by sentiment, largest during Greed.
* Profitability (closed\_pnl) varies with sentiment.

**Market Sentiment Distribution:**

| **Sentiment** | **Number of Trades** |
| --- | --- |
| Fear | 13,869 |
| Greed | 11,292 |
| Extreme Greed | 5,621 |
| Neutral | 2,756 |
| Extreme Fear | 2,326 |

**Buy/Sell Behavior:**

* Traders tend to **buy more** during Fear periods.
* **Sell trades** dominate during Extreme Greed, indicating profit-taking behavior.

**5. Key Insights**

1. **Profitability vs Sentiment:**
   * Traders are generally more profitable during **Greed** periods.
   * Profits decrease in **Extreme Fear** and **Extreme Greed**, suggesting higher risk and cautious behavior during extreme conditions.
2. **Trade Size vs Sentiment:**
   * Larger trades occur during **Greed**, smaller trades during **Extreme Fear**.
   * Suggests traders take bigger positions when the market appears favorable.
3. **Behavioral Trends:**
   * Fear periods see more buy activity — possibly attempting to “buy the dip.”
   * Extreme Greed shows higher sell activity — likely profit-taking.
   * Neutral periods have lower trading activity overall.

**6. Visual Outputs**

* **Average Closed PnL by Sentiment:** outputs/avg\_profit\_by\_sentiment.png
* **Average Trade Size by Sentiment:** outputs/avg\_size\_by\_sentiment.png
* **Buy/Sell Trades by Sentiment:** outputs/buy\_sell\_by\_sentiment.png

**7. Conclusion**

* Trader behavior partially aligns with market sentiment.
* Profitable trades and larger positions are more common during Greed periods.
* Extreme sentiment periods (Fear or Greed) reduce profitability and lead to cautious trading.
* Insights can help **develop smarter trading strategies**, such as adjusting trade size or timing based on sentiment signals.