

# Data Science Assignment Report

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## Objective

The goal of this assignment is to analyze how trading behavior (profitability, risk, volume, leverage) aligns or diverges from overall market sentiment (fear vs greed). Two datasets were used: (1) Bitcoin Market Sentiment (Fear & Greed Index) and (2) Historical Trader Data from Hyperliquid.

## Methodology

- Loaded and explored historical trader data and Fear & Greed index.
- Parsed timestamps, normalized data types, and extracted daily features.
- Aggregated metrics by date: trade count, unique accounts, total volume, net PnL, average trade size, win ratio, and long fraction.
- Merged trader metrics with daily sentiment data.
- Conducted correlation analysis to study the relationship between sentiment and trader performance.
- Visualized results with time series plots and scatter plots.

## Key Findings

- Trading **volume** and **trade count** showed a strong negative correlation with sentiment (Greed=1, Fear=0).
- Higher trading activity was observed during **Fear** days.
- Net PnL also showed a negative correlation with sentiment, indicating traders tended to be more profitable on **Fear** days.
- Win ratio and long/short positioning showed weaker but still relevant patterns.
- Fear & Greed Index values aligned well with the categorical sentiment labels.

## Visual Evidence

Several plots were generated to support these findings, including: - Daily Net PnL over time, showing spikes during Fear periods. - Sentiment trends across the dataset timeline. - Scatter plot of Net PnL vs Sentiment, confirming the negative relationship. These outputs are included in the `outputs/` directory of the submission package.

## Limitations & Next Steps

- Leverage data was not available in the provided dataset, restricting risk analysis.
- Analysis was conducted at a daily aggregation level, missing intraday dynamics.
- Further research could include lead-lag effects: does sentiment predict next-day profitability?
- Cohort analysis by trader type or account volume could reveal deeper behavioral trends.

## Conclusion

This analysis demonstrates a clear relationship between market sentiment and trader behavior. Traders show increased activity and profitability during Fear conditions, suggesting contrarian

opportunities in the market. These insights could be valuable in building smarter trading strategies for the Web3 trading environment.