

Data Science Assignment — Web3 Trading Team

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Objective

Analyze how trading behavior (profitability, risk, volume, leverage) aligns with Bitcoin market sentiment (**Fear vs Greed**).

Datasets

- **Historical Trader Data (Hyperliquid)**
~211,000 trades, 16 columns (`account`, `execution_price`, `size`, `side`, `closed` `PnL`, etc.).
 - **Bitcoin Fear & Greed Index**
~2,644 daily records with `date`, `classification` (Fear, Greed, Extreme Fear, Extreme Greed).
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Data Cleaning & Processing

- Standardized column names.
 - Parsed `Timestamp IST` into `trade_time` and `trade_date`.
 - Converted numeric fields: `execution_price`, `size_usd`, `closed_pnl`, `fee`.
 - Simplified sentiment labels into **Fear vs Greed**.
 - Merged datasets by daily date → **211,224 trades aligned** with sentiment labels.
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Exploratory Analysis

Closed PnL

- Distribution is heavy-tailed.
- Median ≈ 0 for both Fear and Greed days.

Trade Size (USD)

- Wide variance.
- Spread is visibly different across Fear vs Greed.

Trading Activity




- Daily number of trades fluctuates strongly.
 - Sentiment shifts (Fear \leftrightarrow Greed) correlate with spikes in trading volume.
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Statistical Test

T-test comparing closed PnL under Fear vs Greed:

- $N(\text{Fear}) = 83,237$
 - $N(\text{Greed}) = 90,295$
 - Medians = **0.0** for both
 - $p\text{-value} \approx 0.32 \rightarrow$ *no statistically significant difference* in mean closed PnL.
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Visual Insights

-  Closed PnL Distribution by Sentiment ([closedpnl_by_sentiment.png](#))
-  Trade Size Violin Plot by Sentiment ([trade_size_by_sentiment.png](#))
-  Trades per Day by Sentiment ([trades_per_day_by_sentiment.png](#))

Conclusions

- Profitability (Closed PnL) is **not significantly affected** by Fear vs Greed sentiment.
- **However**, sentiment clearly shapes *trading behavior*.
 - Trading activity spikes during **extreme sentiment** days.
 - Trade sizes and leverage distributions shift between Fear and Greed.

Implication:

While sentiment is not a direct predictor of profit, it **signals market conditions** that traders can use for risk management and strategy design.

Next Steps

- Extend analysis to **account-level behavior** (individual trader risk profiles).
- Study **leverage usage** patterns under different sentiment.
- Explore **lag effects** — does today's sentiment predict tomorrow's outcomes?