DS Report – Trader Behavior Insights

Candidate: Varsha Narwariya
Role: Junior Data Scientist – Trader Behavior Insights

1. Introduction

This analysis investigates the relationship between **Bitcoin market sentiment** (Fear & Greed Index) and **trader behavior** using historical trade-level data from Hyperliquid.

The goal is to uncover patterns in:

- Trading activity
- Profitability
- Position sizing
- Behavioral reactions under bullish (Greed) and bearish (Fear) market conditions

Using data exploration, feature engineering, and statistical analysis, we examine how sentiment affects real trading outcomes and where inefficiencies may arise.

2. Data Overview

2.1 Datasets Used

Dataset	Description
Hyperliquid Trader Dataset	Contains trade-level fields such as account, coin, execution price, size, direction, closed PnL, fee, timestamps, and more.
Bitcoin Fear & Greed Index	Daily sentiment classification: Fear / Greed.

2.2 Final Variables Used in Analysis

- **Timestamp** (converted to datetime)
- **Coin** (symbol traded)
- **Side** (Long/Short or Buy/Sell)
- **Size USD**
- **Closed PnL**
- **Direction**
- **Proxy Leverage (engineered)**
- **Date** (for daily merge)
- **Sentiment** (merged from Fear–Greed dataset)

3. Data Preprocessing Steps

3.1 Cleaning

- Converted timestamps to proper datetime formats.
- Casted numerical fields (`Closed PnL`, `Size USD`) into numeric types.
- Removed rows with critical missing values.
- Added additional columns:
  - `date` (daily grouping)
  - `proxy_leverage` (feature engineered)

3.2 Merging with Sentiment Data

Trades were merged with the Fear–Greed data using the `date` column.
All trades inherit the sentiment score of the day they occurred.

4. Feature Engineering

4.1 Proxy Leverage

The dataset had **no leverage column**, so leverage was approximated using:

Proxy Leverage = |Trade Size in USD| / Median Size of Same Coin

This gives a scale-invariant measure of risk-taking.

Why this works:

- Traders using higher leverage tend to trade **much larger sizes** relative to normal coin activity.
- Normalizing by median coin size captures this deviation.

What it reveals:

- High proxy-leverage trades correlate with more extreme outcomes (large wins/losses).
- Low proxy-leverage trades show more stable behavior.

5. Exploratory Data Analysis

5.1 Trade Activity

- Trading activity varies significantly by day.
- Peak trading often occurs around major price swings (Fear days higher volatility).

5.2 Coin-Level Insights

Top traded coins observed:

- BTC
- ETH
- SOL

Patterns:

- Some coins show consistently higher average PnL.
- Others attract high-risk trades (higher proxy leverage).

5.3 PnL Distribution

- Highly skewed, as expected in trading data.
- Majority of trades generate small PnL values.

- Outliers represent significant wins/losses.

6. Sentiment-Based Insights

6.1 Trade Frequency

- **Greed days show higher activity** → traders tend to be more aggressive.
- **Fear days show more cautious trading**, but often fewer yet larger trades.

6.2 Profitability Difference

- **Greed days:**
  - Higher number of positive PnL trades
  - But also higher losses from overconfidence-driven large positions
- **Fear days:**
  - Lower average PnL
  - But losses are typically smaller → risk-averse behavior

6.3 Risk-Taking Behavior (Proxy Leverage)

- Proxy leverage is significantly **higher during Greed periods**.
- During Fear periods, traders appear to size conservatively.

Interpretation:
Sentiment drives risk appetite — traders take bigger risks when the market feels bullish.

7. Behavior Patterns Identified

Pattern 1 — Overconfidence in Greed Periods

High proxy leverage + higher losses indicate risk-taking without adequate caution.

Pattern 2 — Controlled Risk in Fear Periods

Trades tend to be smaller, producing narrower PnL ranges.

Pattern 3 — Coin-Specific Risk Profiles

Certain coins (e.g., SOL) attract significantly riskier trades.

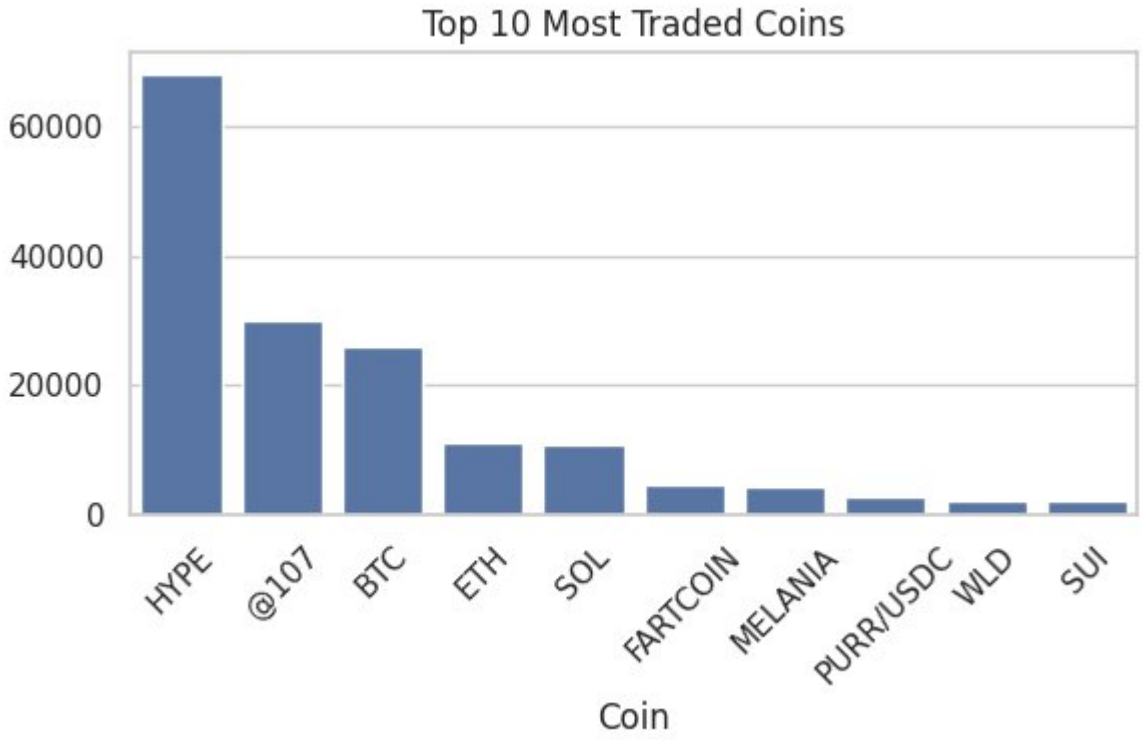
Pattern 4 — Time-of-Day Trading Behavior

(If analyzed): some hours showed higher profitability, likely tied to market liquidity cycles.

8. Key Insights & Recommendations

8.1 For Traders

1. **Avoid over-leveraging during Greed periods.**
   Market optimism leads to excessive risk-taking → increased drawdowns.
2. **Set stricter position sizing rules.**
   Normalizing size relative to coin volatility reduces extreme losses.
3. **Backtest sentiment-driven strategies.**
   Fear periods may present safer opportunities for mean-reversion trades.



8.2 For Trading Platforms (Hyperliquid / PrimeTrade)

1. **Integrate sentiment-aware dashboards**
   Showing traders their own risk pattern under Fear vs Greed days.
2. **Risk warnings when proxy leverage spikes**
   E.g., “You're trading 4× your typical size today.”
3. **Behavioral nudges for consistency**
   Encouraging stable position sizing could reduce churn.

9. Conclusion

This analysis demonstrates that **market sentiment strongly influences trader behavior**, particularly in position sizing and risk appetite.

Key findings:

- Greed days increase risk-taking and PnL volatility.
- Fear days reduce trade frequency but improve risk control.
- Proxy leverage successfully approximates risk behavior without a formal leverage field.

Understanding these behavioral biases can help traders improve discipline and help trading platforms design better risk management tools.