Sentiment-Driven Trading Analysis: Insights from Bitcoin Market Fear & Greed Index

📌 Introduction

This report explores the intricate relationship between trader behavior and overall market sentiment in the cryptocurrency space, specifically focusing on Bitcoin. The analysis leverages two datasets: historical trader performance from the Hyperliquid exchange and the Fear & Greed Index for Bitcoin. The goal is to identify actionable insights and signals that can inform smarter trading strategies.

📊 Data Sources

1. **Bitcoin Market Sentiment Dataset** – Includes daily sentiment classifications: Fear, Greed, Neutral, etc.
2. **Hyperliquid Historical Trader Data** – Captures trades with details such as account, size, leverage, PnL, fees, and timestamps.

🧪 Methodology

* Merged datasets by date using `Timestamp` (converted from ms) and `date` field.
* Conducted EDA using pandas, seaborn, and matplotlib.
* Built statistical visualizations to highlight behavior trends under different sentiment conditions.
* Extracted signals such as volume spikes and leverage anomalies.

🔍 Key Findings

1. **Market Sentiment Distribution**

* Greed and Extreme Greed dominated 60% of the time window.
* Fear-based sentiment (Fear + Extreme Fear) accounted for \~30%.

2. **Trading Volume Trends**

* Spikes in daily trading volume are often aligned with shifts from Fear to Greed.
* Average trade size was highest during Greed conditions.

3. **PnL and Profitability**

* Traders exhibited higher average PnL during periods of Greed.
* Volatility in returns was noticeably higher during Extreme Fear.

4. **Leverage Usage**

* High leverage trades (>20x) were more common during Greed, indicating increased risk appetite.

5. **Fees and Risk Behavior**

* Fee distribution remained relatively stable, but higher leverage correlated with slightly higher average fees.

📈 Visual Outputs (See `outputs/` Folder)

* Pie chart of sentiment distribution
* Time series of trade volume and PnL
* Box and violin plots comparing behavior across sentiment types
* Correlation heatmaps and weekday trade patterns

🚨 Trading Signals

* **Volume Surge Signal**: Trade volume spikes (mean + 2 std) correlate with emotional sentiment transitions.
* **High Leverage Clusters**: Detected in Greed periods, signaling potential overconfidence.
* **PnL Inflection Points**: Identified through average PnL change tracking by date.

✅ Conclusion

This analysis highlights how trader behavior in crypto is tightly linked to market sentiment. Recognizing patterns like high-leverage clusters and PnL fluctuations under different emotions offers an edge in building predictive or reactive strategies. Future work could involve deploying these insights in real-time dashboards or signal-based automated strategies.

📂 Repository Structure Summary

```
ds_<your_name>/
├── notebook_1.ipynb         # EDA
├── notebook_2.ipynb         # Signal Analysis
├── csv_files/               # Datasets
├── outputs/                 # Visualizations
├── ds_report.pdf            # This file
└── README.md                # Project notes
```