Data Science Project Report

Trader Behavior vs Market Sentiment Analysis

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1. Objective

The goal of this project was to explore how **trader behavior** (profitability, leverage, and trading activity) aligns or diverges from **Bitcoin market sentiment**, measured using the Fear and Greed Index. The analysis focuses on identifying behavioral patterns among traders, measuring consistency during different sentiment periods, and understanding how emotional market states affect performance.

2. Data Sources

Two datasets were used:

1. **historical_data.xlsx** – Contains anonymized trading activity including metrics such as average PnL, win rate, leverage, and total volume.

2. **fear_greed_index.xlsx** – Contains daily Bitcoin market sentiment values classified as Fear or Greed based on market conditions.

Both datasets were merged by date to build a unified view of market sentiment and trader performance.

3. Methodology

The analysis was implemented in Google Colab using Python.
Key steps included:

3.1 Data Loading and Initial Checks

- Imported and inspected both datasets to understand structure, dimensions, and missing values.

- Identified and excluded fully empty columns to focus only on meaningful attributes.

3.2 Data Cleaning and Preprocessing

- Removed or imputed missing data.
- Standardized column names for consistency.
- Verified data types and converted timestamps to proper date formats.

3.3 Sentiment Integration

- Merged the Fear and Greed dataset with trading data on the date column.
- Encoded sentiment numerically (Fear = 0, Greed = 1) to enable analysis and visualization.

3.4 Exploratory Data Analysis (EDA)

- Generated descriptive statistics and visualizations to understand the overall data distribution.
- Created **pie charts**, **bar plots**, and **time-series plots** to show:
    - Proportion of Fear vs Greed days.
    - Frequency of each sentiment type.
    - Temporal trend of sentiment changes.

3.5 Feature Engineering

- Computed additional metrics such as daily averages, volatility, and sentiment streaks.
- Grouped and aggregated data by trader and by sentiment phase to compare behaviors.

3.6 Behavioral Analysis

- Analyzed whether profitable traders behave differently under Fear vs Greed conditions.
- Identified possible “sentiment-driven” trading patterns, such as increased risk-taking during Greed phases.

4. Key Insights

- The market sentiment alternates between Fear and Greed phases in measurable cycles.

- Greed periods often correspond to higher trading volume and leverage usage.
- Some traders maintain consistent profitability regardless of sentiment, suggesting disciplined strategies.
- Fear phases generally exhibit reduced activity and lower win rates for most traders.

5. Visual Outputs

All major visualizations were generated using **Matplotlib** and **Seaborn** and stored in the /outputs directory. These include:

- Sentiment distribution charts (pie and bar plots)
- Time-series plots showing sentiment transitions
- Summary tables for streak lengths and classification counts

6. Deliverables and Folder Structure

All files are organized as per submission guidelines:

```
ds_<candidate_name>/
├── notebook_1.ipynb
├── csv_files/
├── outputs/
├── ds_report.pdf
└── README.md
```

7. Tools and Libraries

- **Python 3.10**
- **Pandas** – data manipulation
- **NumPy** – numerical computation
- **Matplotlib** & **Seaborn** – data visualization
- **Google Colab** – notebook execution environment

8. Conclusion

This project successfully demonstrated how trader behavior metrics can be studied alongside the Fear and Greed Index to uncover emotional and strategic differences in market participation. The combination of sentiment analysis and trading data provides a foundation for more advanced predictive modeling, such as forecasting trader profitability or building automated sentiment-aware trading systems.