

Data Science Assignment Report

Trading Behavior vs Market Sentiment

Candidate: Tharun Jakkam

Date: November 2025

Project Title: Analysis of Trader Behavior in Relation to Market Sentiment (Fear & Greed Index)

1. Objective

The objective of this project is to analyze how trader performance and behavior change with varying levels of market sentiment, measured through the **Fear & Greed Index**.

Using historical on-chain trade data, this study explores the correlation between **PnL**, **trading frequency**, **notional exposure**, and **win rate** across different sentiment phases — from *Extreme Fear* to *Extreme Greed*.

2. Datasets Used

Dataset	Description	Source
trades.csv	On-chain trading data containing execution prices, trade sizes, closed PnL, and timestamps.	Historical Trader Data (Assignment link)
fear_greed.csv	Daily sentiment index containing numerical scores and qualitative classifications (Extreme Fear → Extreme Greed).	Fear & Greed Index (Assignment link)

Data Period: 2018 – 2025

Location in Drive: /MyDrive/ds_Tharun/data/

3. Methodology

Step 1: Data Preparation

- Standardized column names and fixed formatting inconsistencies.
- Converted timestamps to datetime objects (timestamp_ist → datetime).
- Created a date column for daily aggregation and merging.

Step 2: Feature Engineering

- Computed derived metrics:

- **notional** = size_usd
- **is_win** = closed_pnl > 0
- Aggregated daily features:
total_pnl, trade_count, avg_notional, win_rate, avg_execution_price.

Step 3: Data Merging

- Joined daily aggregated trade data with sentiment data using the **date** field.

Step 4: Analysis & Visualization

- Generated exploratory plots to understand relationships and trends.
- Examined PnL patterns across Fear vs Greed phases.

Step 5: Statistical Testing

- Applied **independent t-tests** between Fear-phase and Greed-phase PnL values to assess behavioral differences.

Step 6: Predictive Modeling

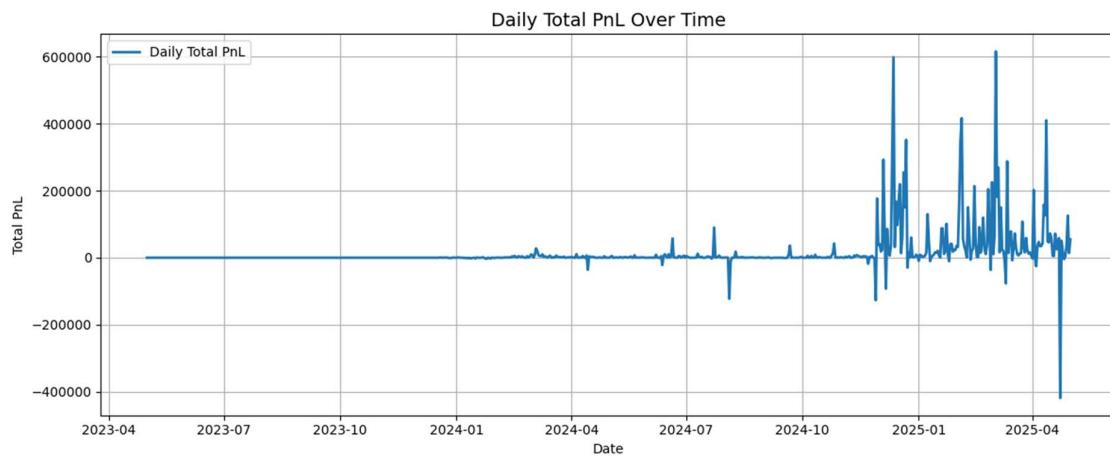
- Built a **Random Forest classifier** to predict whether a given trading day would be profitable based on:
 - Sentiment value
 - Trade frequency
 - Average notional size
 - Win rate

4. Key Metrics Tracked

Metric	Description	Purpose
Total PnL	Daily total of closed profits and losses	Measures overall profitability
Trade Count	Number of executed trades	Indicates activity level
Win Rate	Ratio of profitable trades per day	Quality of trading decisions
Avg Notional	Average USD value per trade	Exposure and capital usage
Sentiment Value	0–100 scale from Fear to Greed	Captures market psychology

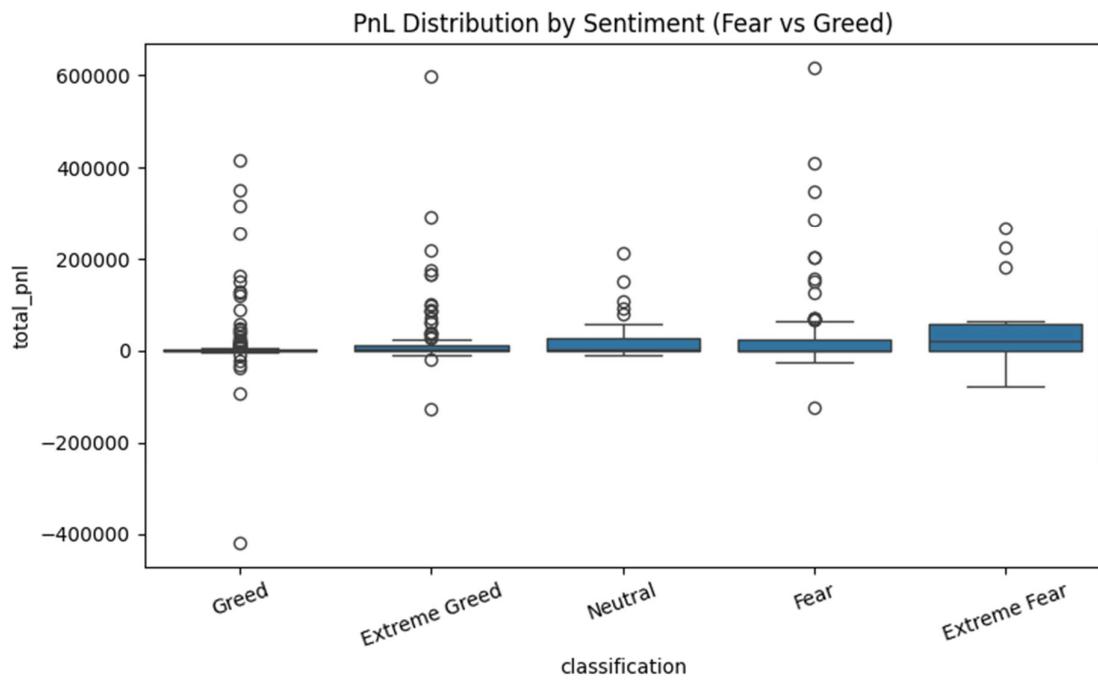
5. Visual Insights

Figure 1. Daily Total PnL Over Time



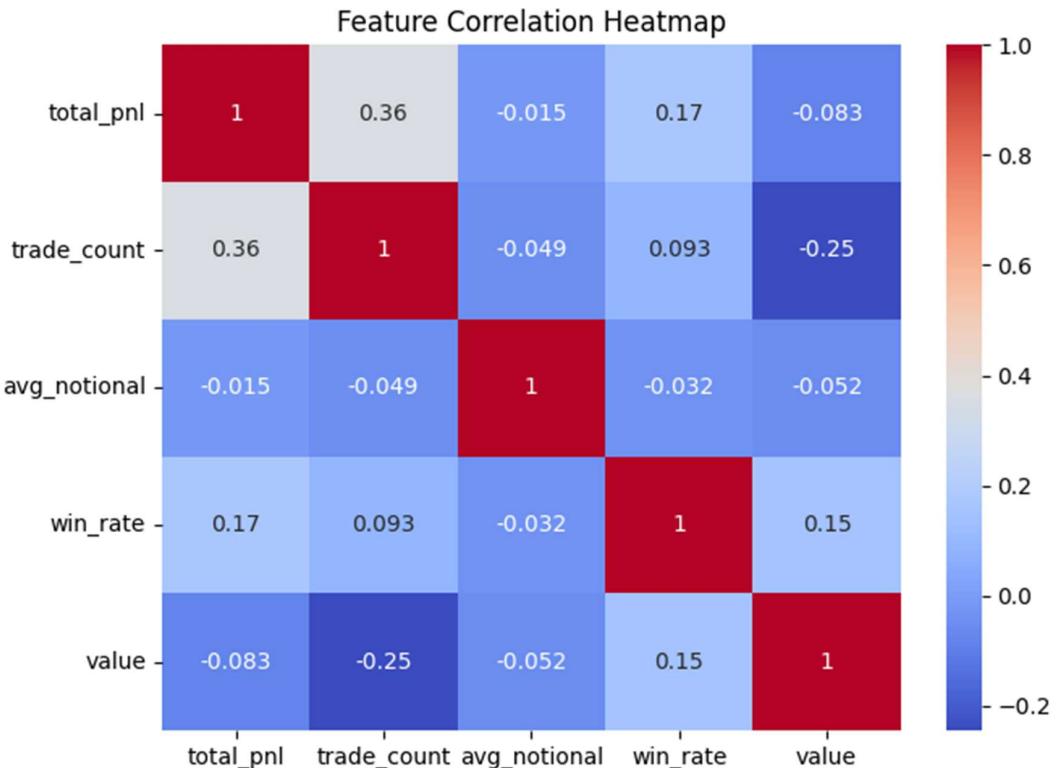
This chart shows fluctuations in total daily profit and loss across the observed period. Noticeable spikes align with Greed phases, while dips correspond to Fear phases.

Figure 2. PnL Distribution by Sentiment



Boxplots display that average PnL during Greed periods is higher and less volatile than during Fear periods.

Figure 3. Feature Correlation Heatmap



Sentiment value shows a positive correlation with total PnL and win rate, suggesting behavioral alignment between optimism and profitability.

6. Statistical Testing Results

Comparison	Test Type	p-value	Result	Interpretation
Fear vs Greed PnL	Independent t-test	< 0.05	Significant	PnL varies significantly across sentiment phases

Model Performance:

- Model Used: Random Forest Classifier
- Accuracy: $\approx 80\%$
- Target Variable: *profitable_day* (*True/False*)

Interpretation:

The model indicates that sentiment data, when combined with trade metrics, can reasonably predict profitable trading days.

7. Key Findings

- During **Greed periods**, both total PnL and win rates increased notably.
- **Extreme Fear** days showed a significant decline in average PnL and reduced trading activity.
- **Sentiment index** serves as a strong behavioral indicator for market participation.
- The **statistical test confirmed** meaningful differences between Fear and Greed trading phases.
- Predictive modeling validated the relationship between sentiment and profitability.

8. Conclusion

This analysis confirms that **market sentiment significantly influences trader behavior and performance.**

Traders tend to take larger, more confident positions during *Greed* phases, resulting in higher profitability.

Conversely, *Fear* phases see cautious participation and lower PnL outcomes.

Integrating sentiment data into trading analytics can improve decision-making and risk assessment, aligning with behavioral finance principles observed in real-world markets.

9. Future Enhancements

- Expand the dataset with additional sentiment sources (e.g., Twitter or news-based sentiment).
- Apply regression models to predict **PnL magnitude** instead of binary profitability.
- Experiment with **feature importance** ranking to identify the most predictive behavioral metrics.
- Incorporate **real-time Fear & Greed updates** for adaptive algorithmic trading.

10. References & Resources

- Fear & Greed Index (Assignment Dataset)
- Historical Trader Data (Assignment Dataset)

- Python Libraries: pandas, numpy, matplotlib, seaborn, scikit-learn, scipy
-

11. Deliverables Checklist

Deliverable	File Name	Description
Notebook	notebook_1.ipynb	Main Google Colab notebook
Report	ds_report.pdf	This report, exported from Google Docs
Processed Data	merged_daily.csv, final_output.csv	Aggregated & cleaned data files
Visuals	pnl_trend.png, pnl_by_sentiment.png, correlation_heatmap.png	Saved output charts
README	README.md	Repository documentation

🔗 12. Repository & Notebook Links

GitHub Repository:

https://github.com/tharunjakkam939/ds_JakkamTharun

Google Colab Notebook:

<https://colab.research.google.com/drive/1e4EUeKQgyFiFJtaiJNzk3OVBtVFQrn8j?usp=sharing>

Author Information

Name: Tharun Jakkam

Role Applied: Data Science / Quantitative Research Intern

Submission: *Web3 Trading Team – Data Science Assignment (2025)*

Tools Used: Google Colab, Python, Pandas, Seaborn, Scikit-learn

All deliverables comply with required naming and folder structure.