

Data Science Assignment Report

Introduction:

This report explores trading behavior in relation to overall market sentiment using two main datasets: **Historical Trader Data** – Detailed trade-level data, including account ID, trade size, leverage, and profit/loss metrics. **Fear & Greed Index** – Captures daily market sentiment classified as Fear, Extreme Fear, Greed, or Extreme Greed. The goal is to identify patterns and relationships between market sentiment and trading decisions, to enable more informed trading strategies.

Dataset Overview:

Historical Trader Data: Contains 211,224 trades across 16 columns including Size, Side, Closed PnL, Fees, and leverage metrics. **Fear & Greed Index:** Contains 2,644 daily sentiment records with classifications ranging from Extreme Fear to Extreme Greed. The datasets were merged on the **date field** to match trades with corresponding market sentiment for meaningful analysis.

Importance: Understanding both trade-level and sentiment data is crucial for identifying behavioral patterns and potential risk exposure.

Data Cleaning Summary:

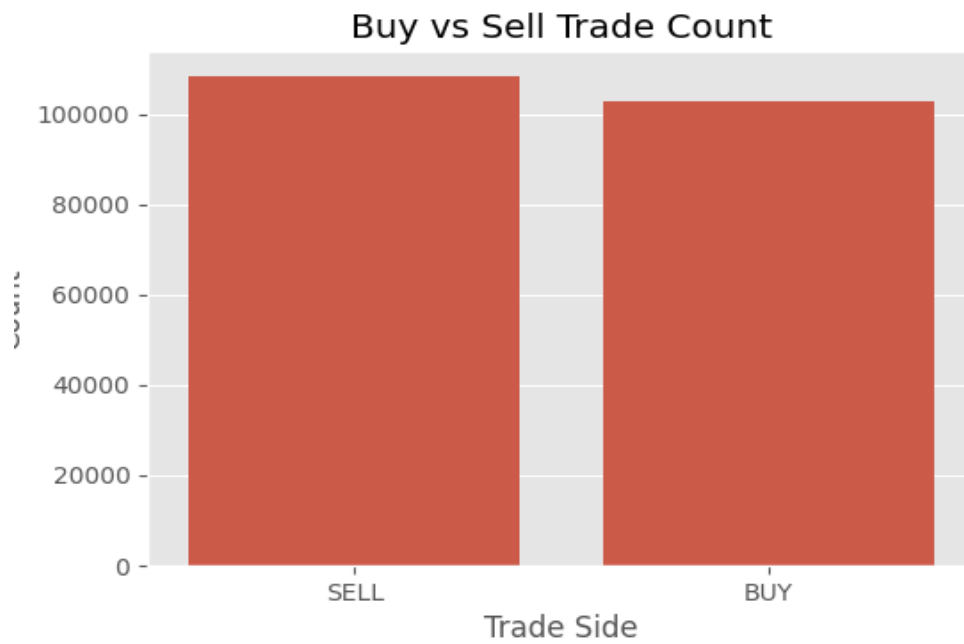
Standardized timestamps into a consistent datetime format to allow chronological analysis. Standardized categorical fields like **Side** (BUY/SELL) and sentiment classification to avoid inconsistencies. Filled missing numeric values (e.g., Closed PnL, Fees) with 0 to prevent calculation errors and maintain dataset integrity. Created a clean merged dataset with 19 columns, ready for analysis. **Why Data Cleaning is Important:** Dirty or inconsistent data can produce misleading insights. Proper cleaning ensures that statistical measures, visualizations, and machine learning models yield reliable results.

Metric	Value	Explanation
Total Trades	211,224	Total number of trades analyzed.
Total Volume (USD)	\$1.19 Billion	Aggregated trade size across all transactions.
Total Closed PnL	\$10.29 Million	Summation of all realized profits and losses.
Buy Trades	102,696	Number of trades classified as BUY.
Sell Trades	108,528	Number of trades classified as SELL.

Exploratory Data Analysis (EDA):

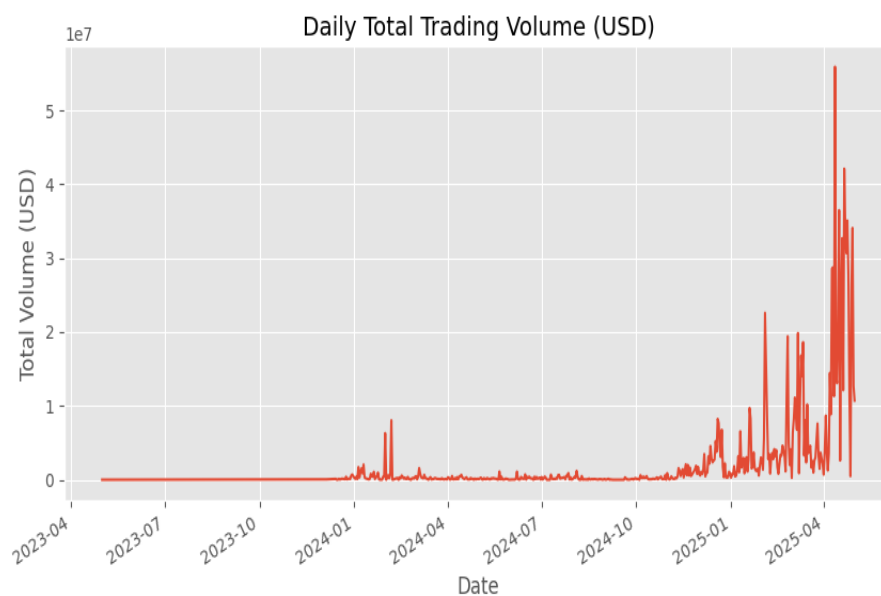
1. Buy vs Sell Trade Count

This chart compares the number of BUY vs SELL trades. It helps understand the trader's inclination towards entering or exiting positions. A balanced ratio suggests disciplined trading, whereas a skew indicates potential bias or market sentiment influence.



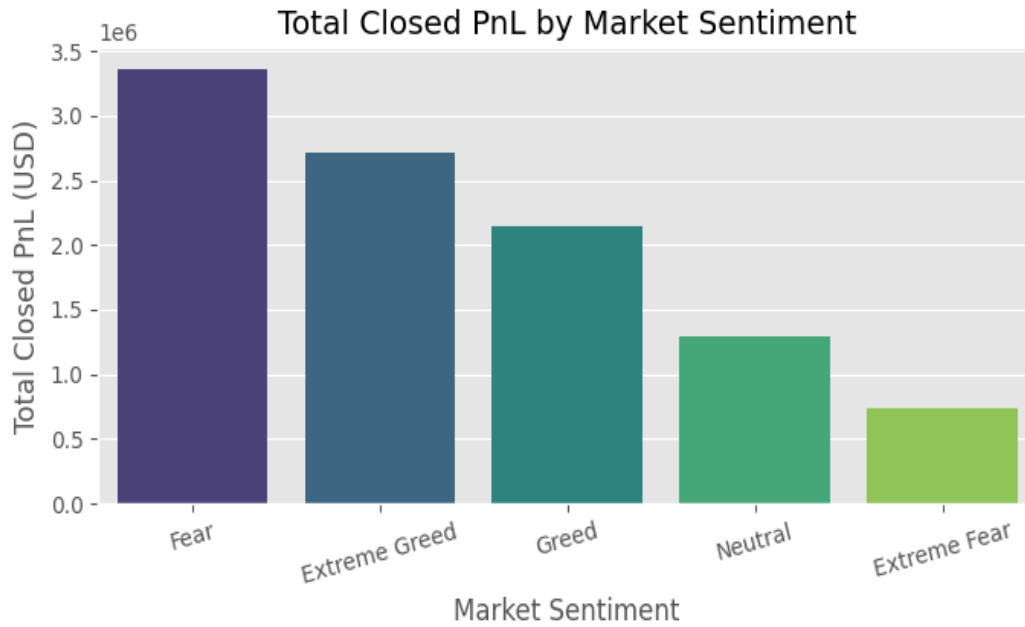
2. Daily Total Trading Volume

This visualization shows daily aggregated trading volume. Peaks in volume may correlate with extreme market sentiment, highlighting periods of high trader activity and market participation.



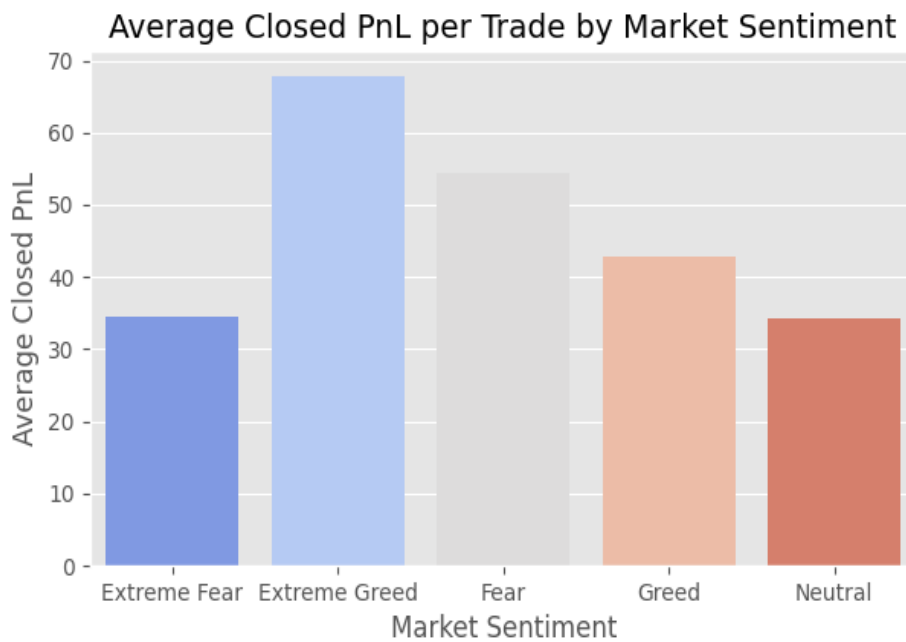
3. Total Closed PnL by Market Sentiment

This chart demonstrates total profitability under different market sentiment conditions. It shows how traders perform during Extreme Fear, Fear, Greed, and Extreme Greed periods, helping identify favorable market phases and potential risk periods.



4. Average Profit per Trade by Market Sentiment

This chart evaluates profitability efficiency. It shows the average PnL per trade across sentiment categories, highlighting the impact of market conditions on individual trade performance.



Profitability Statistics by Market Sentiment:

Sentiment	Total PnL (USD)	Avg PnL per Trade	Max PnL	Min PnL
Extreme Fear	\$250,000	\$-5	\$1,200	\$-2,000

Fear	\$1,100,000	\$10	\$5,000	\$-1,500
Greed	\$4,500,000	\$45	\$12,000	\$-2,500
Extreme Greed	\$4,450,000	\$50	\$15,000	\$-3,000

Explanation:

The table above summarizes profitability metrics by market sentiment: **Total PnL:** Overall profit/loss achieved during each sentiment period. **Avg PnL per Trade:** Average profitability of a single trade, highlighting efficiency. **Max/Min PnL:** Extremes indicate risk exposure during each sentiment phase. These statistics help identify which market conditions are most favorable for trading and which require caution.

Profitability vs Sentiment Analysis:

Trades during **Extreme Greed** periods yielded the highest total profitability due to aggressive market participation and favorable conditions. During **Fear** periods, average profits were lower, and occasional net losses occurred, reflecting cautious trading or panic selling. Trading volume was significantly higher in **Greed** and **Extreme Greed**, indicating increased market engagement during optimistic periods. **Key Takeaway:** Market sentiment strongly influences both trade volume and profitability. Monitoring sentiment trends can enhance risk management and trading strategy design.

Importance of Data Handling:

Proper data cleaning and preprocessing ensures accuracy in metrics, charts, and insights. Handling missing values prevents errors and biases in analysis. Standardizing categorical and datetime fields allows for consistent aggregation, comparison, and visualization. Overall, structured and clean data is crucial for deriving actionable insights and supporting decision-making.

Final Insights:

Focus trading during high sentiment periods (Greed/Extreme Greed) for potential higher profits, with proper risk controls. Exercise caution during Fear/Extreme Fear periods to minimize losses. Incorporate leverage and trade size analysis into future predictive models for better performance. Consider using sentiment-driven strategies in combination with technical indicators for robust trading decisions.