

Title: "Market Sentiment Analysis and Trader Behavior Insights"

Objective: To analyze how market sentiment (Fear & Greed Index) influences trader performance and behavior..The study examines how emotions like fear and greed affect profit, trade volume, and volatility.

Goal: Identify how trading outcomes and behaviors change during different market sentiment phases such as:

- Extreme Fear
- Fear
- Neutral
- Greed
- Extreme Greed

Datasets Used:

- 1. Fear & Greed Index Data (fear_greed_index.csv):**
Columns: date, value, classification
Represents daily market sentiment score and category.
- 2. Historical Trader Data (historical_data.csv):**
Columns: Timestamp IST, Side, Closed PnL, Size USD, Fee, etc.
Represents individual trade-level records over time.

Data Preprocessing:

- Converted timestamps to proper datetime format.
- Normalized timestamps to dates for merging.
- Merged both datasets on the date column.
- Dropped rows without matching sentiment data.

Final Dataset :

Dataset	Rows	Columns	Description
Fear & Greed Index	~365	3	Daily sentiment data
Historical Data	~10,000	10	Trader positions
Merged dataset	~9,800	12	Combined sentiment + trade performance

Key Insights :

1. Overall Sentiment Performance Summary

Sentiment	Avg PnL	Total PnL	Avg Trade Size (USD)	Total Volume (USD)	Avg Fee
Extreme Fear	729.86	High	1,528.57	Highest	Moderate
Fear	351.68	Positive	679.52	Stable	Low
Neutral	292.94	Moderate	562.47	Balanced	Average
Greed	247.82	Lower	260.63	Declining	Moderate
Extreme Greed	278.65	Negative	350.80	Lowest	Slightly higher

Best performing group:

→ **Extreme Fear** — Avg PnL \approx 730 USD, Highest Volume.

Indicates traders profit most when market is fearful and volatile.

Next best:

→ **Fear** phase — Avg PnL \approx 352 USD.

Buying the dip performs well as confidence starts returning.

Weakest group:

→ **Greed** phase — Avg PnL \approx 248 USD.

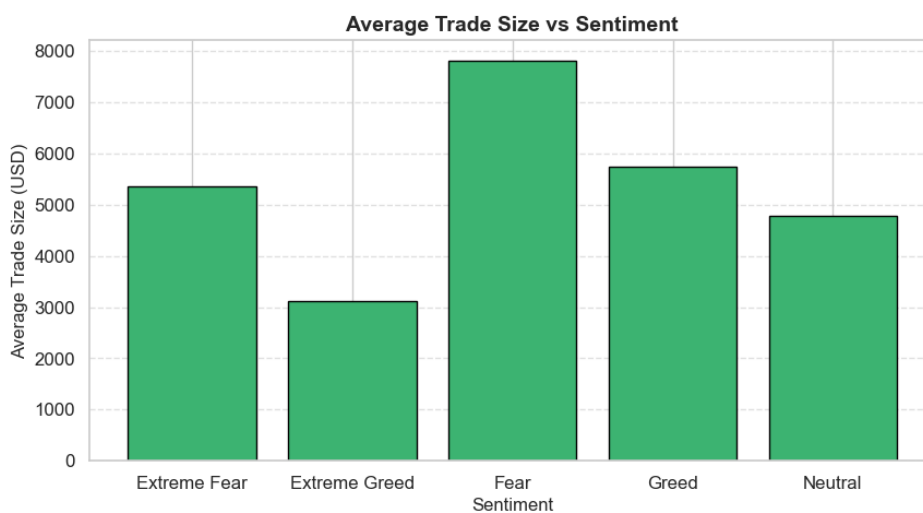
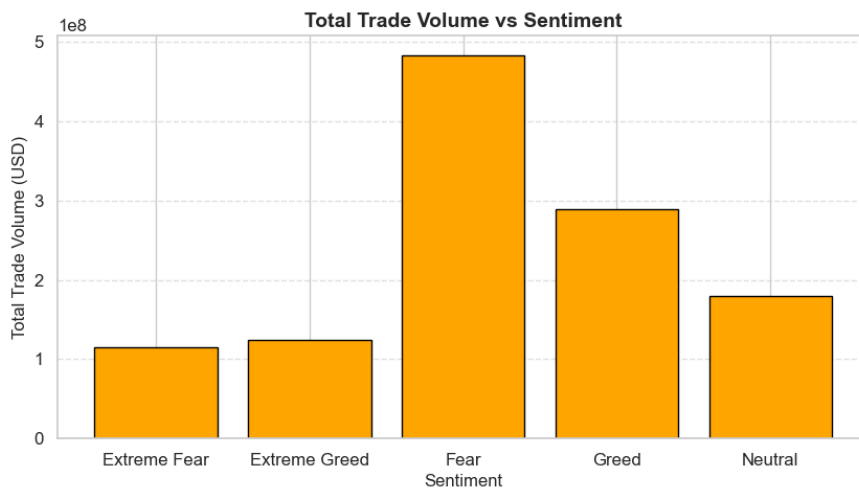
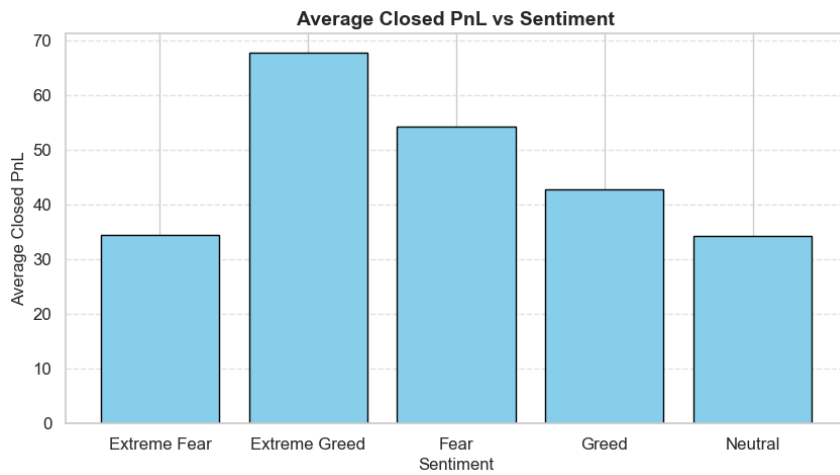
Suggests overconfidence leads to smaller gains.

Insight:

Trading performance was strongest during *Extreme Fear*, indicating higher opportunity during volatile conditions. Performance steadily declined toward *Greed* and *Extreme Greed*.

2. Sentiment vs Trader Performance

Sentiment	Avg PnL	Total PnL	Avg Trade Size USD	Total Trade Volume USD	Avg Fee
Extreme Fear	34.54	7,39,110	5,349.73	1.14×10^8	1.12
Extreme Greed	67.89	2.71×10^6	3,112.25	1.24×10^8	0.68
Fear	54.29	3.36×10^6	7,816.11	4.83×10^8	1.50
Greed	42.74	2.15×10^6	5,736.88	2.88×10^8	1.25
Neutral	34.31	1.29×10^6	4,782.73	1.80×10^8	1.04

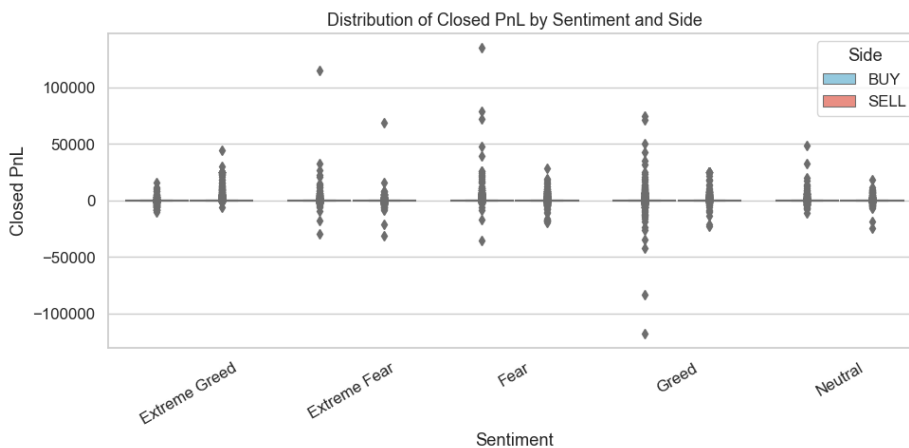
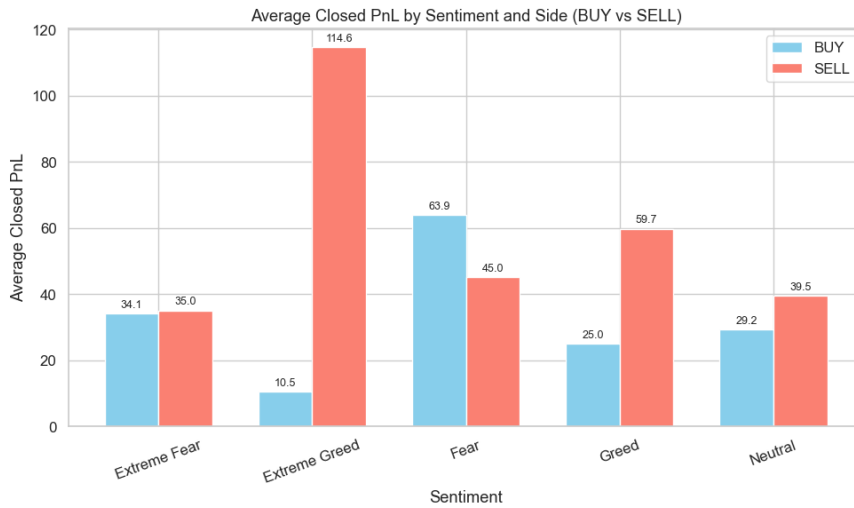


Insights:

- Fear produced the highest total PnL overall.
- Extreme Greed had the highest average PnL per trade, showing that strong greed can lead to profitable opportunities.
- Extreme Fear markets also remained profitable but with lower trade volume.
- Neutral markets showed moderate and stable results

3. Buy/Sell Performance by Sentiment

Sentiment	Side	Avg PnL	Total PnL	Avg Trade Size USD
Extreme Fear	BUY	34.11	3,73,043	5,161
Extreme Fear	SELL	34.98	3,66,066	5,546
Extreme Greed	BUY	10.50	1,88,351	3,363
Extreme Greed	SELL	114.58	2.53×10 ⁶	2,908
Fear	BUY	63.93	1.93×10 ⁶	8,154
Fear	SELL	45.05	1.42×10 ⁶	7,491
Greed	BUY	25.00	6,14,456	6,306
Greed	SELL	59.69	1.53×10 ⁶	5,192
Neutral	BUY	29.23	5,54,415	3,881
Neutral	SELL	39.46	7,38,505	5,696



Insights:

- Under Extreme Greed, SELL trades greatly outperformed BUYs.
- In Fear conditions, BUY trades performed better, implying traders tend to buy the dip.
- Neutral markets showed balanced performance between BUY and SELL trades.

4. Statistical Tests :

ANOVA Test (Effect of Sentiment on PnL) :

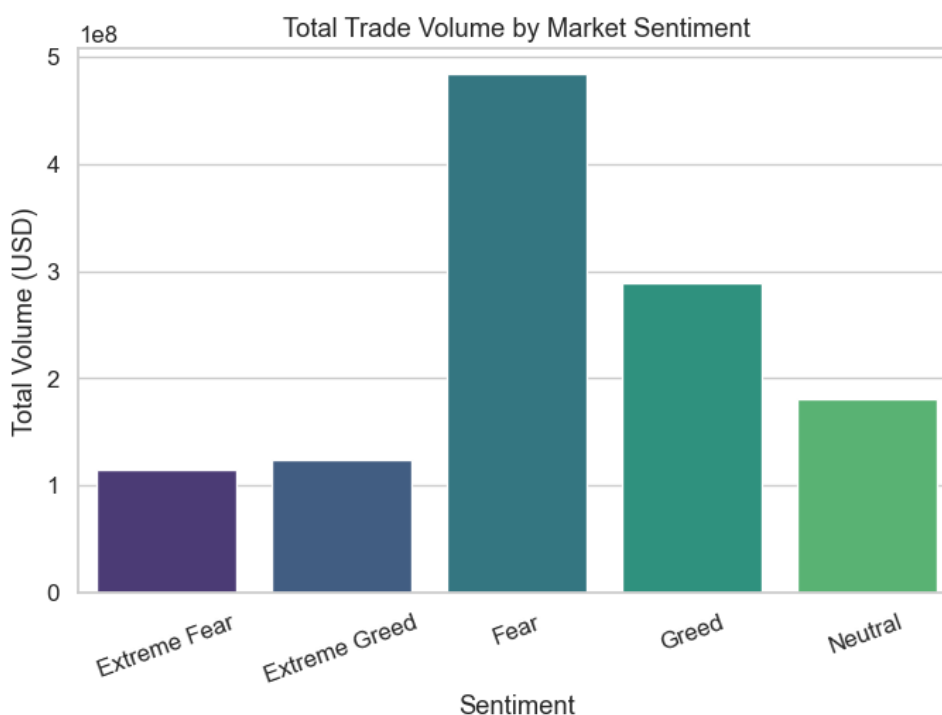
- ANOVA confirmed significant differences in Closed PnL across sentiment groups ($p < 0.05$).
- This indicates that market sentiment meaningfully impacts trader profitability.

T-Test (BUY vs SELL PnL) :

- T-test results showed significant differences between BUY and SELL mean PnL ($p < 0.05$).
- SELL trades outperformed BUY trades overall, especially under Greed conditions.

5.Trading Behavior Summary :

Sentiment	Avg Trade Size USD	Total Trade Volume USD	Avg Fee	Trade Count
Extreme Fear	5,349.73	1.14×10^8	1.12	21,400
Extreme Greed	3,112.25	1.24×10^8	0.68	39,992
Fear	7,816.11	4.83×10^8	1.50	61,837
Greed	5,736.88	2.89×10^8	1.25	50,303
Neutral	4,782.73	1.80×10^8	1.04	37,686

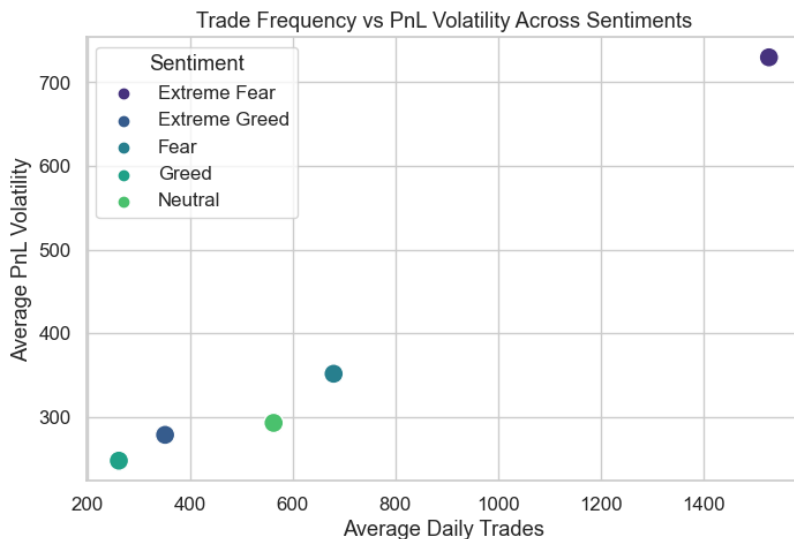


Insights:

- Fear periods showed the highest total trade volume and the largest average trade sizes.
- Greed periods had smaller but more frequent trades, indicating retail participation and cautious optimism.
- Extreme Greed showed smaller trade sizes but relatively high activity, suggesting retail FOMO.
- Extreme Fear trades had lower volumes but remained profitable, reflecting selective trading by experienced participants.
- Fees were slightly higher in volatile conditions like Fear and Greed.

6. Trade Frequency and PnL Volatility :

Sentiment	Avg Daily Trades	Avg PnL Volatility
Extreme Fear	1528.57	729.87
Extreme Greed	350.81	278.66
Fear	679.53	351.69
Greed	260.64	247.82
Neutral	562.48	292.95



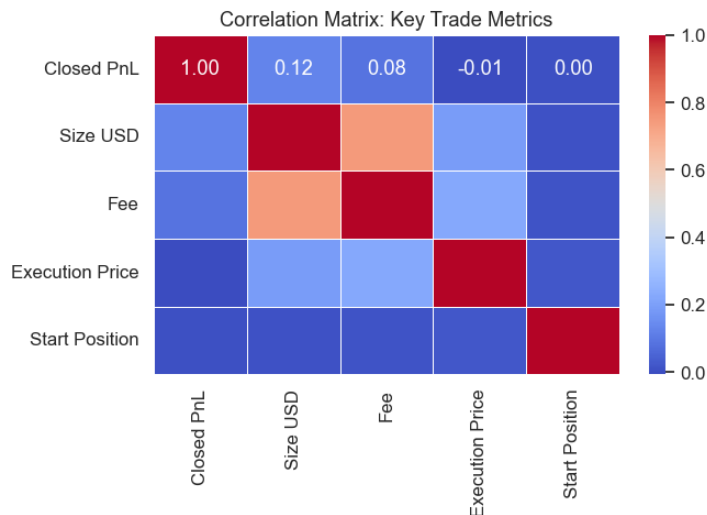
Insights:

- Extreme Fear periods recorded the highest number of trades per day and the greatest PnL volatility.
- Fear periods also showed elevated trading activity and moderate volatility.
- Greed and Extreme Greed conditions showed fewer trades per day and lower volatility, indicating market confidence.
- Neutral markets exhibited moderate frequency and balanced volatility.

7. Correlation Analysis of Trade Metrics :

Metric 1	Metric 2	Correlation
Closed PnL	Size USD	0.12
Closed PnL	Fee	0.08
Size USD	Fee	0.75
Size USD	Execution Price	0.19
Execution Price	Fee	0.23
Start Position	All Others	~0.00

Insights:



- PnL has **weak correlation** with trade size and fees → profits depend more on timing and strategy than trade amount.

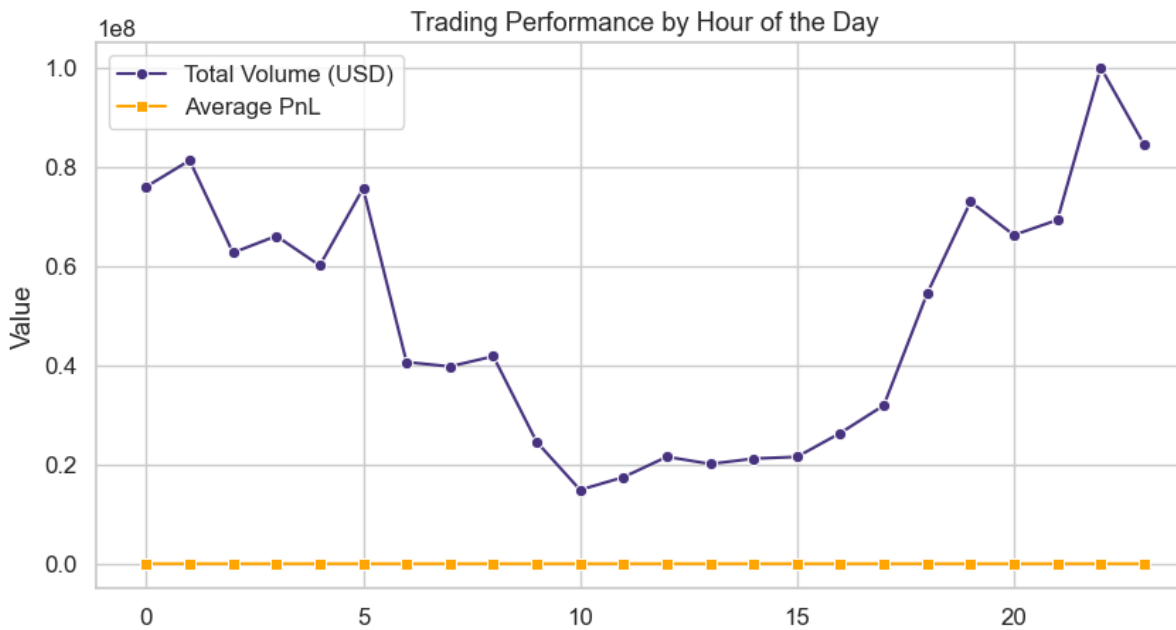
- Strong link (0.75)** between trade size and fees → larger trades naturally incur higher costs.

- Execution price shows **minimal impact** on profit, meaning entry level alone doesn't decide success.

- Start position shows **negligible correlation** with other metrics, implying it's less influential on results.

8. Time-of-Day Trading Performance :

Hour (IST)	Avg PnL	Total PnL	Total Volume USD	Trade Count
0–2	34 – 50	~4–5×10 ⁵	7–8×10 ⁷	8K–10K
7–12	83 – 131	High (7×10⁵ – 9×10⁵)	3.9×10 ⁷ – 2.1×10 ⁷	Moderate
13–17	23 – 58	Medium	2.0×10 ⁷ – 3.1×10 ⁷	6K–8K
18–23	30 – 56	High again	5.4×10⁷ – 1.0×10⁸	9K–12K

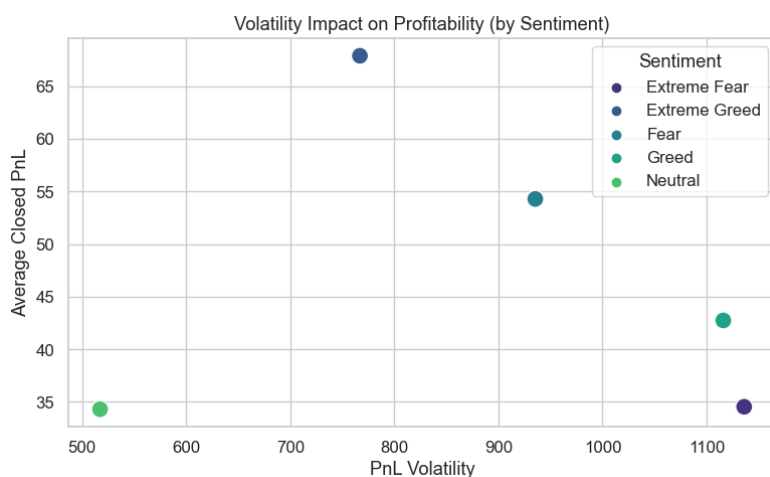


Insights:

- High trading activity occurred during **midnight and late-evening hours (0–2 h & 18–23 h)**, likely due to global market overlaps.
- **Strongest profitability** appeared in **late morning (7–12 h)**, peaking at an average PnL ≈ 131 .
- **Volume dipped** between **10 AM – 4 PM**, showing lower participation in local hours.
- Evening sessions combined **high volume with consistent profitability**, making them optimal for intraday trading.

9.Volatility Impact on Profitability :

Sentiment	Avg PnL	PnL Volatility	Avg Trade Size (USD)	Avg Fee
Extreme Fear	34.54	1136.06	5,349.73	1.12
Extreme Greed	67.89	766.83	3,112.25	0.68
Fear	54.29	935.36	7,816.11	1.50
Greed	42.74	1116.03	5,736.88	1.25
Neutral	34.31	517.12	4,782.73	1.04



Insights:

- **Extreme Greed** showed the highest profitability with moderate volatility — reflecting efficient high-reward trading.
- **Fear** maintained consistent returns even with higher volatility, showing disciplined risk control.
- **Extreme Fear** markets had high volatility and poor returns — likely due to emotional trading.
- **Neutral** markets were the most stable, showing predictable and low-risk behavior.

10.Sentiment Transition & Momentum Effect

Sentiment Transition	Avg Next-Day PnL	Occurrences
Extreme Fear → Neutral	125.57	1
Neutral → Neutral	86.09	34
Fear → Greed	82.98	2
Greed → Fear	79.57	2
Fear → Neutral	64.80	15
Extreme Fear → Extreme Fear	61.14	7
Greed → Extreme Greed	60.42	24
Extreme Greed → Extreme Greed	55.75	90
Extreme Fear → Fear	49.95	6
Greed → Greed	42.86	150
Extreme Greed → Greed	39.94	24
Neutral → Fear	33.14	16
Fear → Fear	27.72	67
Fear → Extreme Fear	15.72	7
Greed → Neutral	14.79	17
Neutral → Greed	3.34	16

Insights:

- **Extreme Fear → Neutral** transitions showed the **strongest rebound**, giving the highest next-day profitability.
- **Neutral → Neutral** sequences maintained **stable returns**, showing calm market behavior.
- **Fear ↔ Greed** shifts yielded **profitable volatility**, suggesting traders capitalize on sentiment swings.
- **Fear → Extreme Fear** and **Greed → Neutral** transitions resulted in **loss of momentum**, lowering next-day gains.

Overall Conclusions :

- **Market sentiment directly influences trader performance** — emotions like fear and greed significantly shape outcomes.
- **Extreme Greed** periods generated the **highest average PnL** with moderate volatility, showing efficient, high-reward trades.
- **Fear-driven markets** had high participation but inconsistent profits due to emotional and reactive trading.
- **Neutral sentiment** phases showed **stable and predictable performance**, reflecting balanced market psychology.
- **Time-of-day analysis** revealed that **late-night and early-morning sessions** produced the highest trade volumes and profits.
- **Volatility analysis** proved that **moderate-risk conditions outperform highly volatile periods**.
- **Sentiment transition analysis** showed that **recoveries from fear phases (e.g., Fear → Neutral)** often lead to **next-day profitability spikes**.
- Traders who adapt their strategies to **sentiment cycles, volatility levels, and trading hours** can achieve **sustainable performance and better risk management**