Data Science Assignment – Trader Behavior vs Market Sentiment

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Objective:

Analyze how trading behavior (profitability, risk, volume, leverage) aligns or diverges from overall market sentiment (fear vs greed). Identify hidden trends or signals that could influence smarter trading strategies.

Datasets:

- *Bitcoin Market Sentiment dataset (Date, Classification)*
- *Historical Trader Data from Hyperliquid (`account`, `symbol`, `execution price`, `size`, `side`, `time`, `start position`, `event`, `closedPnL`, `leverage`, etc.)*

3. Data Preparation

1. **-Cleaning & Preprocessing Data**:
   a. Converted `Date` and `time` to datetime objects.
   b. Extracted daily trader stats (mean PnL, total volume).
   c. Merged with sentiment data on `Date`.
   d. Handled missing values .

Merged data :

```
merged = pd.merge(daily_trader, sentiment, left_on='Date', right_on='date', how='inner')
print(merged.head())
```

```
         Date  Closed PnL   Size Tokens   timestamp  value classification  \
0 2024-01-19   -0.022667       0.62000  1705642200     51        Neutral
1 2024-01-22   24.296850  144668.00048  1705901400     55          Greed
2 2024-01-26   45.100000   40000.00000  1706247000     49        Neutral
3 2024-01-29    0.857720    8368.00000  1706506200     55          Greed
4 2024-02-14   41.355718  114348.60000  1707888600     74          Greed

         date
0 2024-01-19
1 2024-01-22
2 2024-01-26
3 2024-01-29
4 2024-02-14
```

4. Exploratory Data Analysis (EDA)

Outputs:

1. **Distribution of Sentiment** (Fear vs Greed vs Neutral)
   - The bar of the grade vs days is higher than that of the other behaviors.

2. **Profitability by Sentiment** (boxplot)
   -Traders might **perform better during Extreme Fear markets**.
   -During **Greed days**, profit doesn't increase significantly possibly due to over-leveraging or influenced by seeing others investing resulting in crowded trades.

3. **Trading Volume by Sentiment** (bar chart)
   - **Over Extreme Greed** dominates trading volume which suggests that traders become highly active when they think others are investing, speculating that it might profit in future or due to FOMO.

4. **PnL Over Time by Sentiment** (scatter plot)
   - On Neutral sentiment day the pnl is stable which suggests when traders sentiments are under control they tend not to make higher or lower swings.
   -Both Greed and Fear show more spread outcomes suggests that as the sentiments intensity increases the pnl varaibility increases.
   -On Extreme Greed and extreme fear day we can observe a large leap in profit/loss which suggests the strong sentiment is higher the profit or risk .
   - We can observe most of the pnl stats cluster around small pnl values that is in the centre of the graph(close to zero).

6. Insights & Patterns

- **Risk**: - As the stats show, traders with high greed and fear sentiments push traders to take bigger risks and happen to be in more profit /loss compared to other sentimental traders.

- **Volume**: - Greed might be the reason traders tend to risk more and are very active while it can lead to higher loss/profit but traders might over leverage resulting in less profit or heavy loss.

- **Correlations**:
  - Sentiments vs Volume - Higher greed is correlated to higher trading volumes.
  -Sentiments vs pnl Volume - Extreme sentiments like Extreme greed and extreme fear has larger swings that are higher profits or higher loss.
  -Sentiments vs pnl Outcome - Extreme sentiments like Extreme greed and extreme fear might lead to traders investing larger sums but doesn't necessarily mean that the trader might get high profits as over leveraging cancels out net gain.
  -Fear vs. Greed - Both extreme states have diverse stats but it seems that extreme greed seems to push activity up more than extreme fear. We observed Greed results in more trades vs Fear results in fewer trades but has high diverse outcomes.
- **Profitability** - Extreme Greed and Extreme Fear generates more profit but only for traders who manage risk well. Neutral is safer but less profitable, while moderate Greed/Fear provide balanced but smaller opportunities.

7. Conclusion

Our analysis suggests that while Greed days see higher trading volume and leverage, profitability is inconsistent. Fear periods, though quieter, may offer more stable returns. These findings or data can help people better manage their risks and decide how much capital to invest in specific trades.