Deciphering Decisions

Final Assignment

Problem Statement

The final task will be to replicate the paper *"A Game-Theoretical Approach for Designing Market Trading Strategies"*, which was discussed in our meeting. This project will be completed in several steps, detailed below.

Step 1: Define Fuzzy Logic for Candlestick Patterns

Select any two of the following candlestick patterns and define a fuzzy logic system for each, similar to the one discussed in the paper:

1. Hammer
2. Marubozu
3. Shooting Star
4. Doji

In addition, use the Narrow Range indicator as defined in the paper and select any two parameters for the function.

Step 2: Combine Indicators Using Methodology

Follow the methodology outlined in the paper to combine the four different patterns (2 candlestick patterns and the Narrow Range Function with 2 different parameters) indicators and produce a single output. Set a threshold value based on this output to determine when to buy or sell the stock.

Step 3: Evolve the Strategy (Optional)

Optionally, evolve the strategy over several generations using the coevolutionary algorithm discussed in the paper. This involves iteratively improving the strategy by simulating a competitive environment where multiple strategies evolve simultaneously.

Step 4: Implement and Compare

Implement the final strategy on the NIFTY 50 index over the period from **January 1, 2022, to January 1, 2024**. Compare the performance of your strategy to a simple buy-and-hold approach. Specifically, calculate and analyze the following metrics for both strategies:

- Daily Returns
- Cumulative Returns
- Maximum Drawdowns
- Sharpe Ratio
- Sortino Ratio

Guidelines

- Ensure that your implementation is consistent with the methodologies and principles discussed in the paper.
- Use appropriate libraries and tools (e.g., `yfinance`, `pandas`, `numpy`) to fetch data, calculate metrics, and visualize results.
- Document your code thoroughly, explaining the rationale behind each step of your implementation.
- Provide clear visualizations (e.g., charts, graphs) to illustrate the performance of your strategy compared to the buy-and-hold strategy.
- Summarize your findings in a written report, discussing the effectiveness of the trading strategy, insights gained from the replication, and any challenges encountered during implementation.

Submission

- Submit your code as a Jupyter notebook or Python script.
- Include a written report summarizing your methodology, analysis, and conclusions.

- Ensure that all visualizations and tables are properly labeled and referenced in your report.
- Provide a link to the original paper and clearly state how its methodology was applied in your project.