Game Theory Based Stock Price Prediction Model

Pranav Sirodaria, Suyamoon Pathak, Dr. Shakti Mishra
Department of Computer Science and Engineering

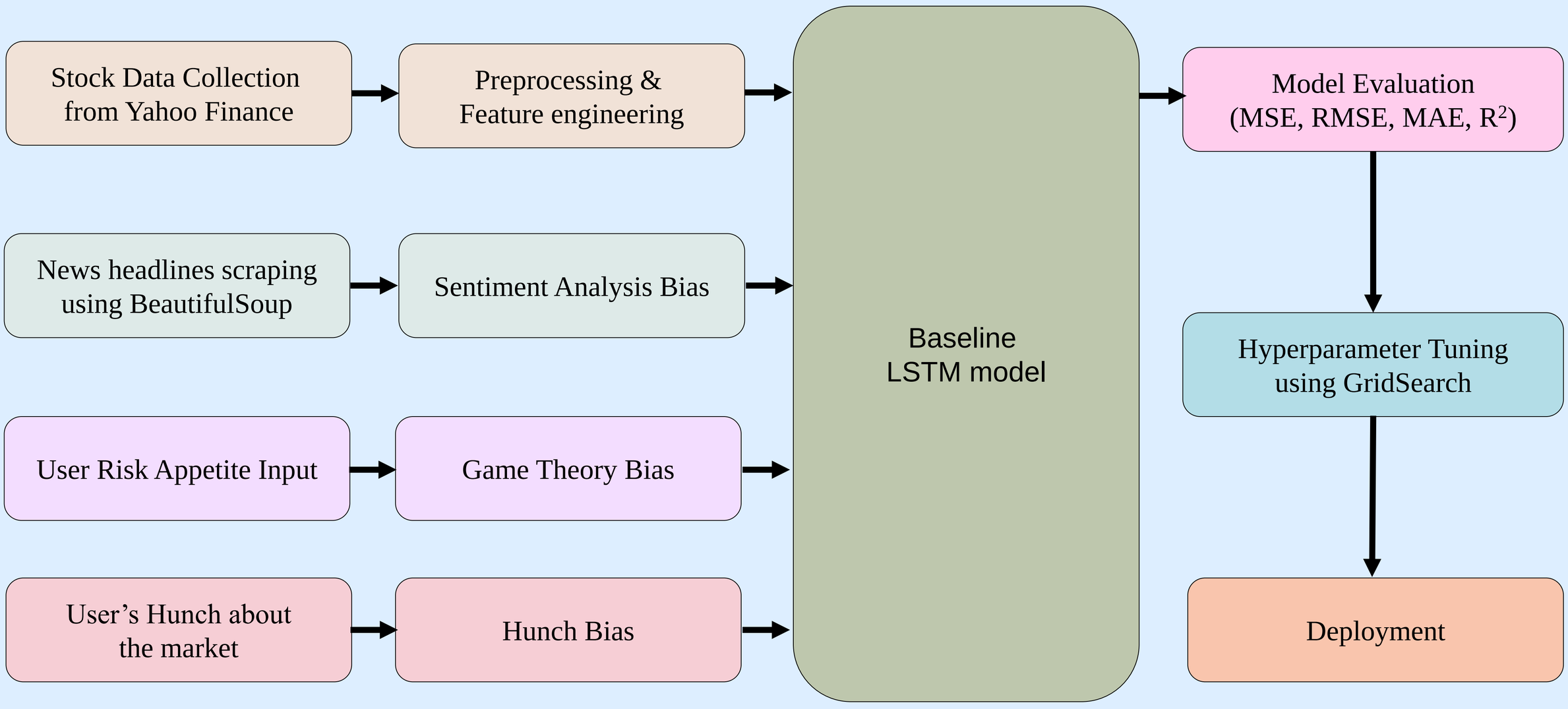
Brief Motivation

- **Researching Cutting-Edge Approaches:** This project is driven by a research-driven curiosity to explore innovative ways to predict stock prices, combining game theory and sentiment analysis with deep learning.
- **Advancing Predictive Capabilities:** It aims to advance stock price prediction models, pushing the boundaries of traditional methods. The research seeks to enhance our understanding of how market dynamics, risk perception, and sentiment impact stock prices.
- **Contributing to Quantitative Finance:** By bridging the gap between theoretical concepts and real-world market behavior, this research project aims to contribute valuable insights to the field of quantitative finance and inspire further research in the domain.

Objective

- **Develop Innovative Predictive Models:** Create advanced predictive models that incorporate game theory and sentiment analysis into LSTM-based stock price predictions.
- **Analyze Market Dynamics:** Investigate how market dynamics, risk perception, and sentiment interact to influence stock prices, leading to a deeper understanding of financial markets.
- **Study Risk-Return Relationships:** Investigate the risk-return dynamics in stock trading strategies with a focus on how game theory and sentiment analysis impact investment choices.
- **Optimize Stock Price Predictions:** Enhance stock price prediction accuracy by integrating game theory and sentiment analysis into the model.

Methodology



Expected Results

	Close	Predictions
Date		
2018-03-09	44.994999	43.889915
2018-03-12	45.430000	44.073620
2018-03-13	44.992500	44.364258
2018-03-14	44.610001	44.553276
2018-03-15	44.662498	44.597301
...	...	...
2023-10-25	171.100006	159.460831
2023-10-26	166.889999	158.763779
2023-10-27	168.220001	157.427353
2023-10-30	170.289993	156.443375
2023-10-31	170.770004	156.137665

1422 rows × 2 columns

Fig. Results Comparison

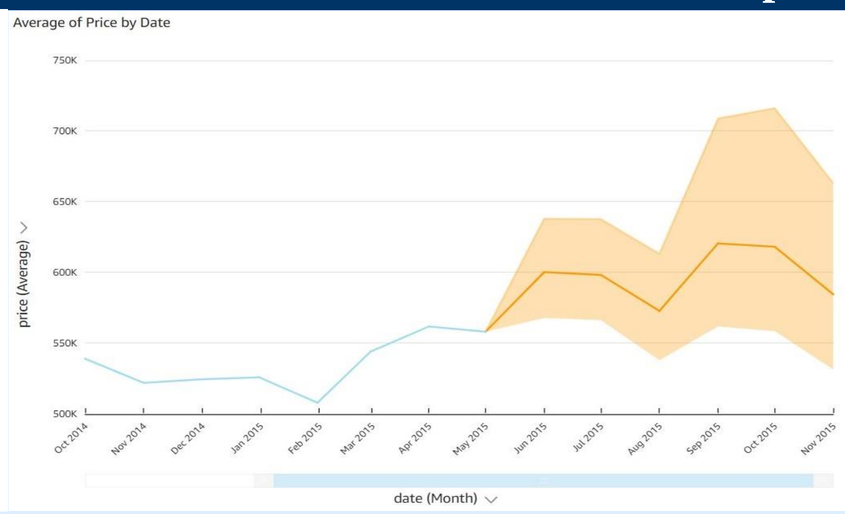


Fig 1. Predictions according to user's risk appetite

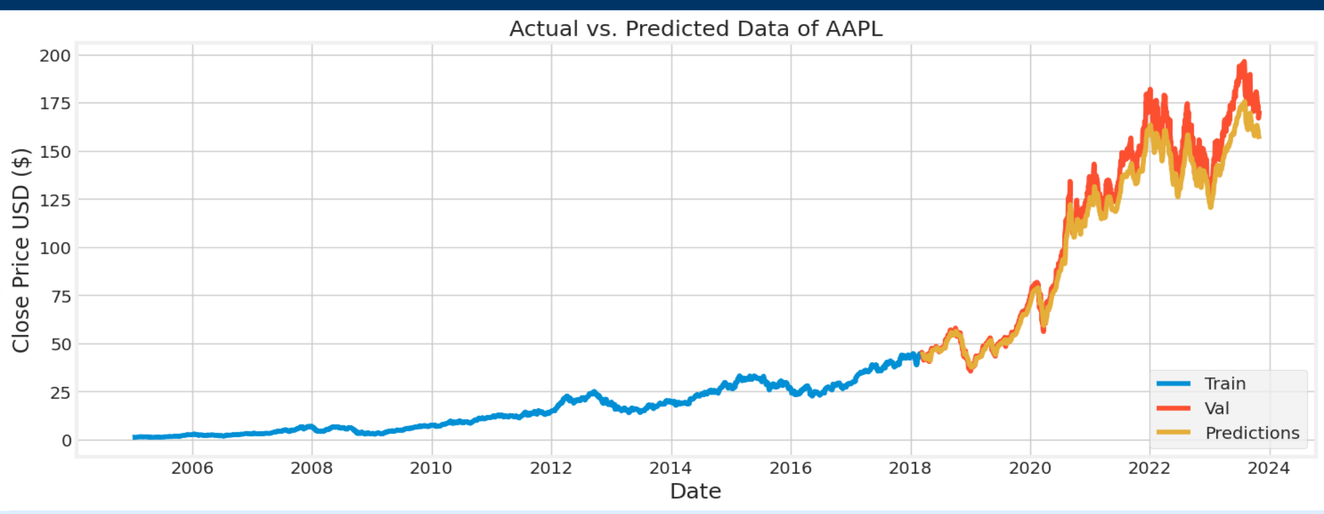


Fig 2. Close Price vs Date plot for AAPL

Root Mean Squared Error (RMSE): 3.2976953216500977
Mean Squared Error (MSE): 10.87479443443294
Mean Absolute Error (MAE): 2.364754434040998
R-Squared (R^2) Score: 0.9955254019952362

Fig 3. Error Metrics

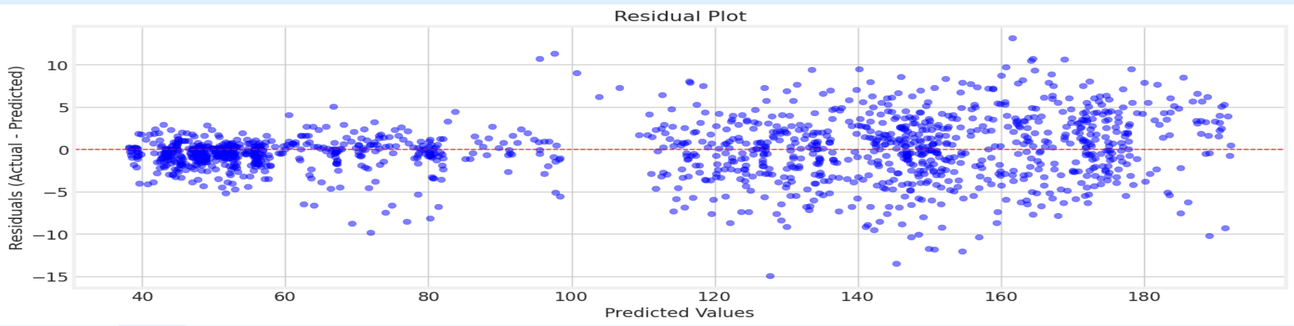


Fig 4. Residual Plot

Outcomes

- **Improved Predictive Models:** The project is anticipated to yield more accurate stock price prediction models by incorporating game theory and sentiment analysis.
- **Enhanced Market Insights:** Through data analysis, the research aims to provide a deeper understanding of how market dynamics, sentiment, and risk perception affect stock prices.
- **Contributions to Finance:** The findings may contribute valuable insights to the field of quantitative finance, potentially inspiring further research and applications in stock price prediction.
- **Informed Investment Strategies:** The research may lead to the development of more informed and data-driven investment strategies, potentially assisting investors in making better-informed decisions in the financial markets.

Bibliography/ References

[1] João Filipe Costa Freitas. (n.d.). Game Theory applied to the Financial Markets. U. Porto. https://repositorio-aberto.up.pt/bitstream/10216/130183/2/429765.pdf

[2] V. S. Triveni, T. Deepthi, M. P. Molimol. (2022). Optimal Game Theory Model for Stock Price Prediction . Mathematical Statistician and Engineering Applications, 71(4), 3043–3054. https://doi.org/10.17762/msea.v71i4.863

[3] Engle, E. (2008). The stock market as a game: an agent based approach to trading in stocks. Social Science Research Network. https://doi.org/10.2139/ssrn.1270025