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Stock Price Prediction Web Using Time Series Models



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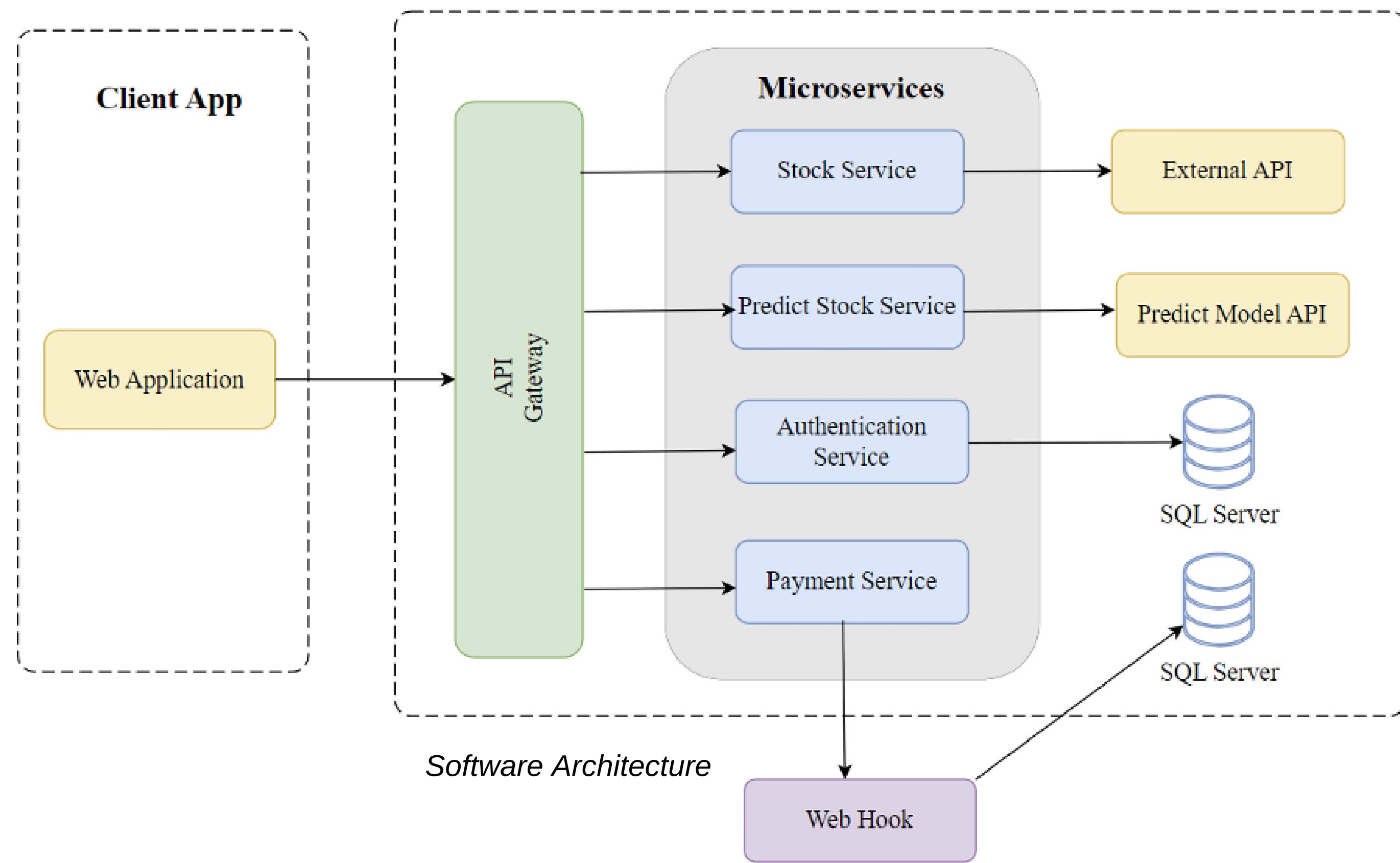
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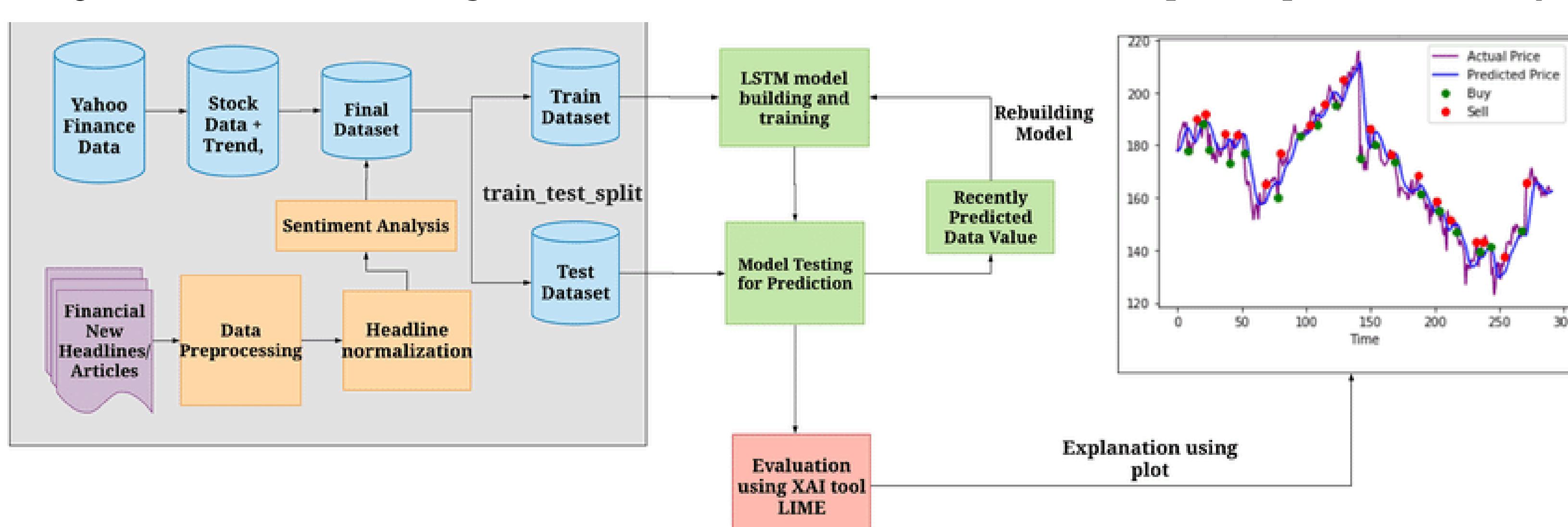
Introduction

In the era of globalization and rapid technological change, financial markets face unprecedented volatility due to economic, political, and social events, making stock price predictions challenging. Data science and AI, particularly time series forecasting and machine learning, offer new analysis avenues. This research develops a web-based stock price prediction system using advanced models like ARIMA and LSTM. The system processes historical stock data to forecast future movements, with LSTM capturing long-term dependencies for accurate predictions. Ultimately, the system supports data-driven decision-making for investors through a user-friendly interface that offers insights into market trends and optimizes investment strategies.



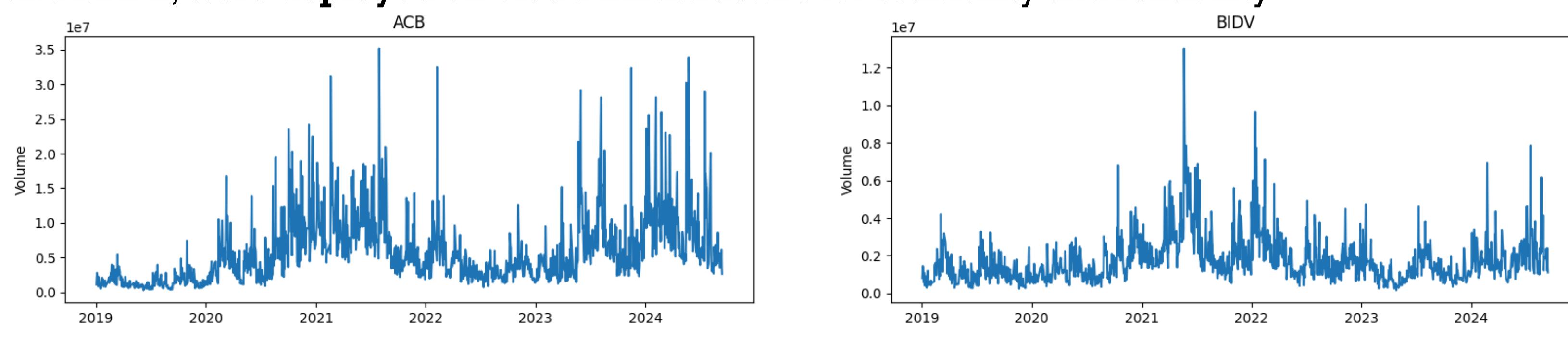
Methods

This study predicts stock prices using ARIMA and LSTM models. Historical stock prices, trading volumes, and preprocessed data are inputs. ARIMA captures linear relationships, while LSTM handles non-linear patterns to predict 30-day prices based on the past 15 days. Input is shaped (5,1), with two LSTM layers (200 nodes, Leaky ReLU) and dense layers reducing to 50 inputs for five forecasted prices. Mean Squared Error is optimized with ADAM and a custom learning rate using Tensorflow's LearningRateScheduler. Walk-forward validation updates predictions daily.



Overview of the Stock Price Prediction Workflow

The microservices architecture ensured scalability and flexibility, with features like user login, stock predictions, and data comparisons. It used a front-end client, API Gateway, and microservices for data processing. Microsoft SQL Server stored data, Angular powered the UI, and FastAPI connected to TensorFlow and Scikit-learn models. Real-time financial APIs enabled stock analysis, visualized with Matplotlib. ARIMA and LSTM models, evaluated with RMSE and MAPE, were deployed on cloud infrastructure for scalability and reliability.



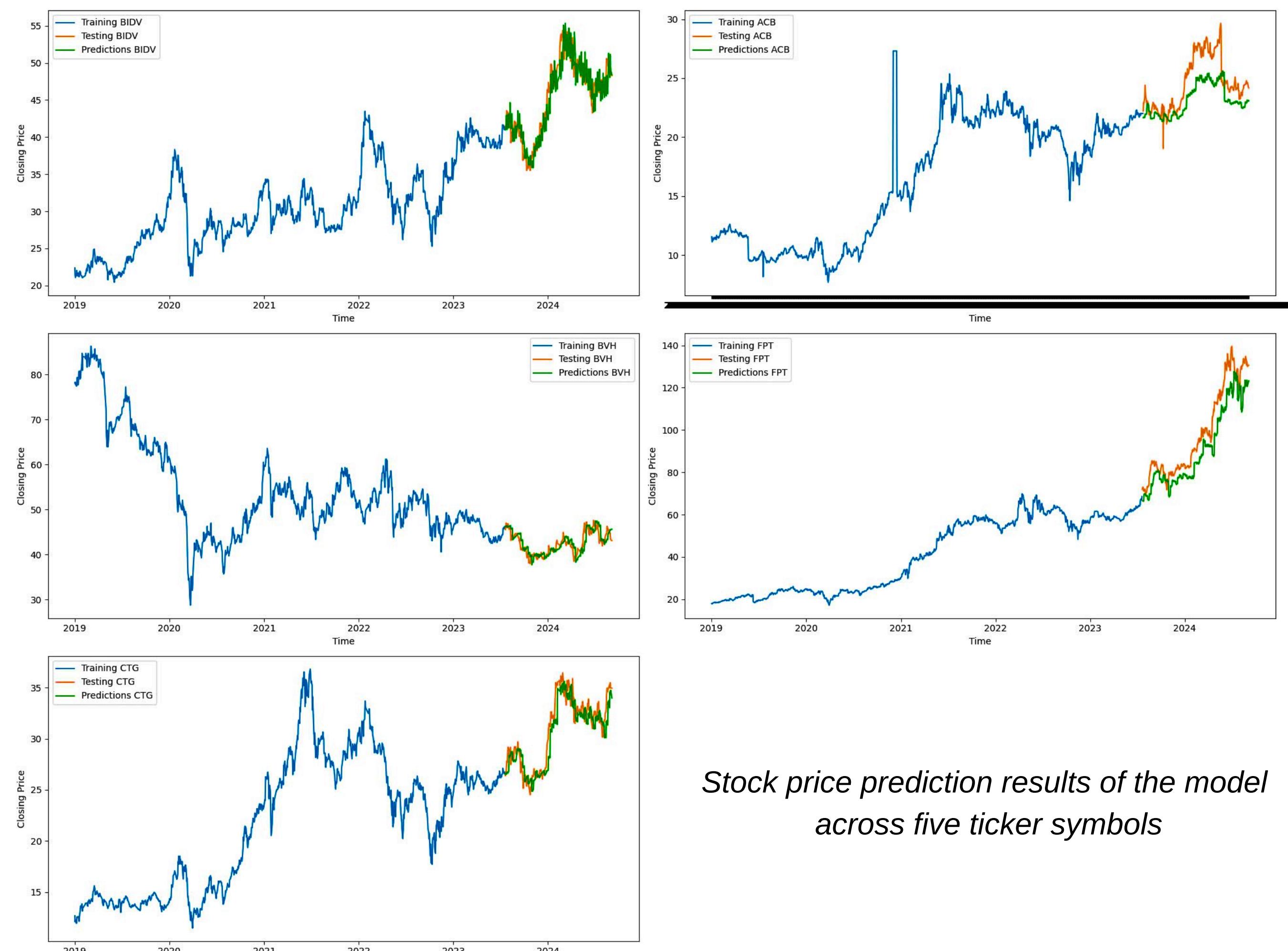
The total volume of stock being traded each day

Result

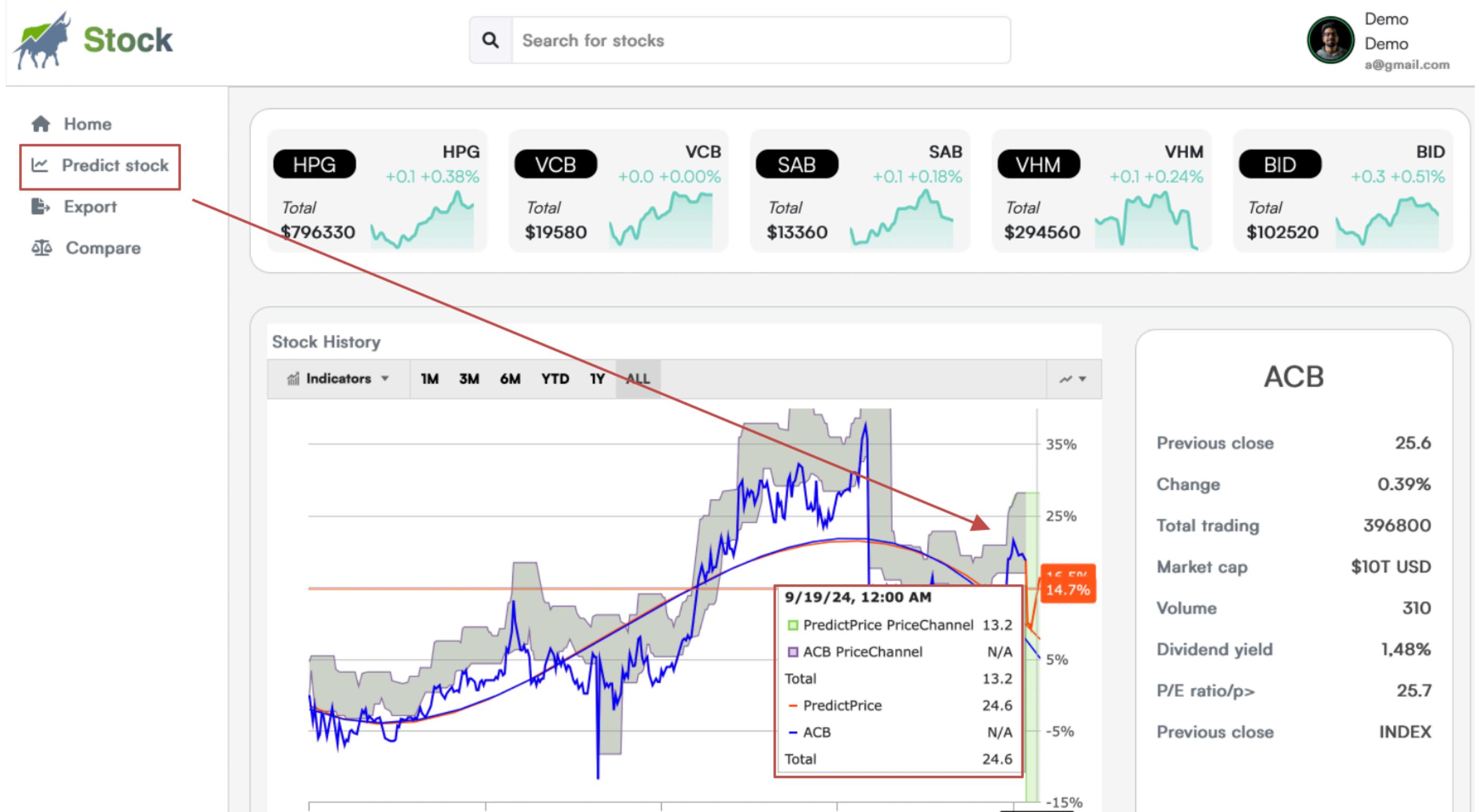
Deep Learning Model Results				
Company / Digital Currency	RMSE	MAPE	MAE	SEM
ACB	1.6783	5.39%	1.3827	0.0699
BIDV	3.1662	5.46%	2.5834	0.1244
BVH	1.4457	2.58%	1.0944	0.0863
CTG	1.6195	4.00%	1.2687	0.0813
FPT	13.9527	36.71%	11.6538	0.4630

ARIMA Model Results				
Company / Digital Currency	RMSE	MAPE	MAE	SEM
ACB	6.3428	6.22%	5.5095	0.1868
BIDV	5.1022	6.10%	4.2803	0.2285
BVH	2.9092	2.07%	2.9092	0.1930
CTG	3.3969	5.07%	3.5005	0.2166
FPT	21.0259	14.02%	15.8303	0.8233

- ARIMA shows higher RMSE and MAE compared to Deep Learning in most cases, especially for ACB and CTG, indicating its **lower accuracy**.
- However, for FPT, ARIMA achieves **RMSE of 21.0259** and **MAE of 15.8303**, which, while not small, are lower than those of Deep Learning, making ARIMA more effective for this specific case.
- Deep Learning models generally **outperform ARIMA in accuracy (RMSE, MAPE, MAE)**, except for FPT, where ARIMA delivers better results.



The stock price prediction system leveraged LSTM to forecast future prices by capturing long-term dependencies in time-series data and processing key market features like opening/closing prices, trading volume, and financial indicators. LSTM effectively handled noisy data and market volatility, boosting prediction accuracy. Optimizations training speed, and financial charts offered clear comparisons between historical and predicted prices to aid trend assessment.



Future development will expand forecasts to include socio-economic factors like exchange rate and market indices. Adding SVM and RNN models will improve accuracy and timeliness. Enhancing the mobile app and building a web module for managing listed companies will boost user experience and support better investment decisions.



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