1. Introduction

This report details the stock market prediction approach implemented during the hackathon. The research was based on deep learning techniques, particularly a hybrid model combining Long Short-Term Memory (LSTM) and Bidirectional Gated Recurrent Unit (BiGRU).

2. Methodology

The proposed stock market prediction model follows a two-stage approach:

1. **Data Preprocessing:** This includes:
    - Web scraping for historical stock data
    - Handling missing values
    - Feature selection
    - Data normalization
2. **Prediction Model:** A hybrid deep learning model combining LSTM and BiGRU was used to predict future closing prices of stocks. This method was chosen due to its effectiveness in capturing long-term dependencies in sequential financial data.

3. Data Sources

Data for training and testing the model was obtained from publicly available stock market datasets. Data was collected from sources such as Yahoo Finance and Kaggle.

4. Model Performance

To evaluate the effectiveness of the BiGRU-LSTM model, standard performance metrics were used:

- **Mean Absolute Error (MAE):** 0.2099
- **Mean Squared Error (MSE):** 0.0831
- **Root Mean Squared Error (RMSE):** 0.2883
- **R-squared (R^2):** 0.9948

Compared to other methods, the proposed BiGRU-LSTM model demonstrated superior accuracy and lower error rates.

5. Insights and Findings

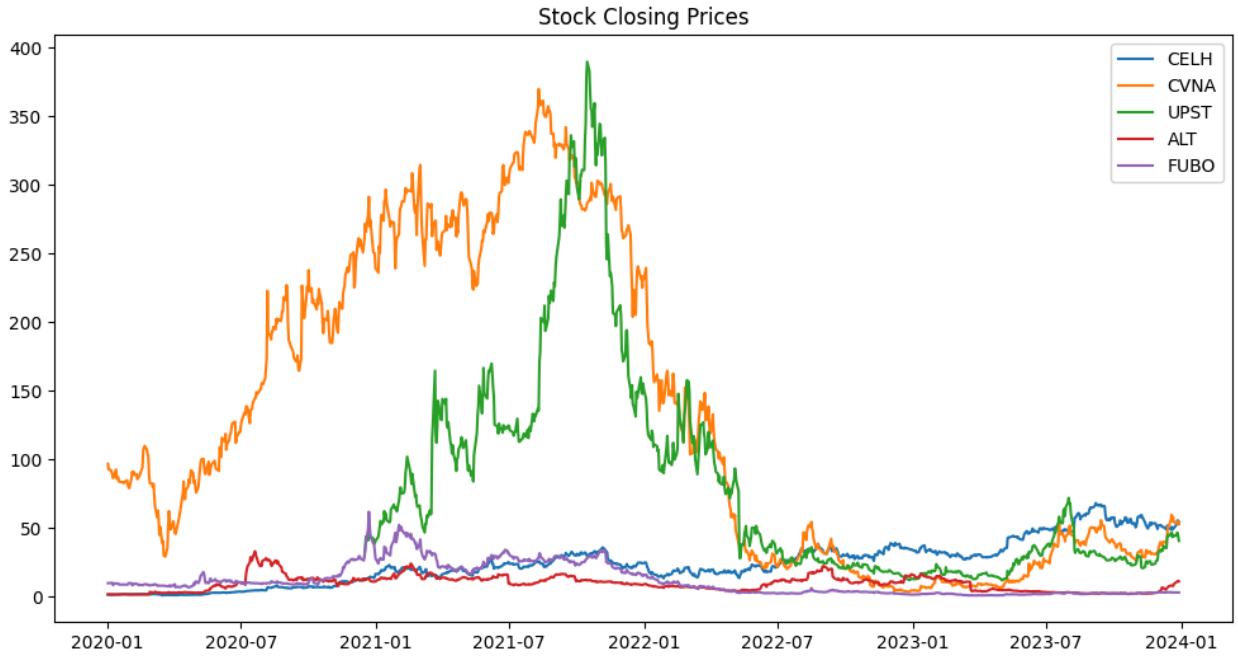
The results indicate that combining BiGRU and LSTM enhances predictive accuracy by effectively handling sequential dependencies in stock prices. The model outperformed traditional

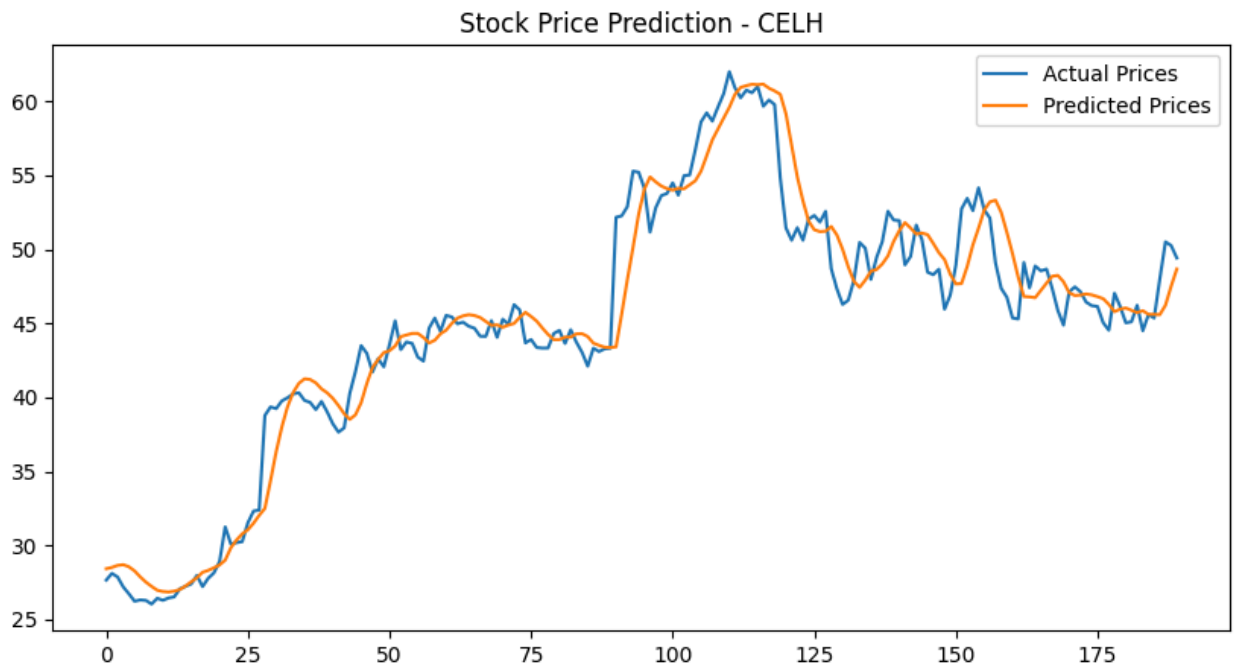
methods such as standard LSTM, CNN, and SVM-based models. Additionally, real-time stock price predictions can be incorporated into trading strategies for better decision-making.

6. Conclusion

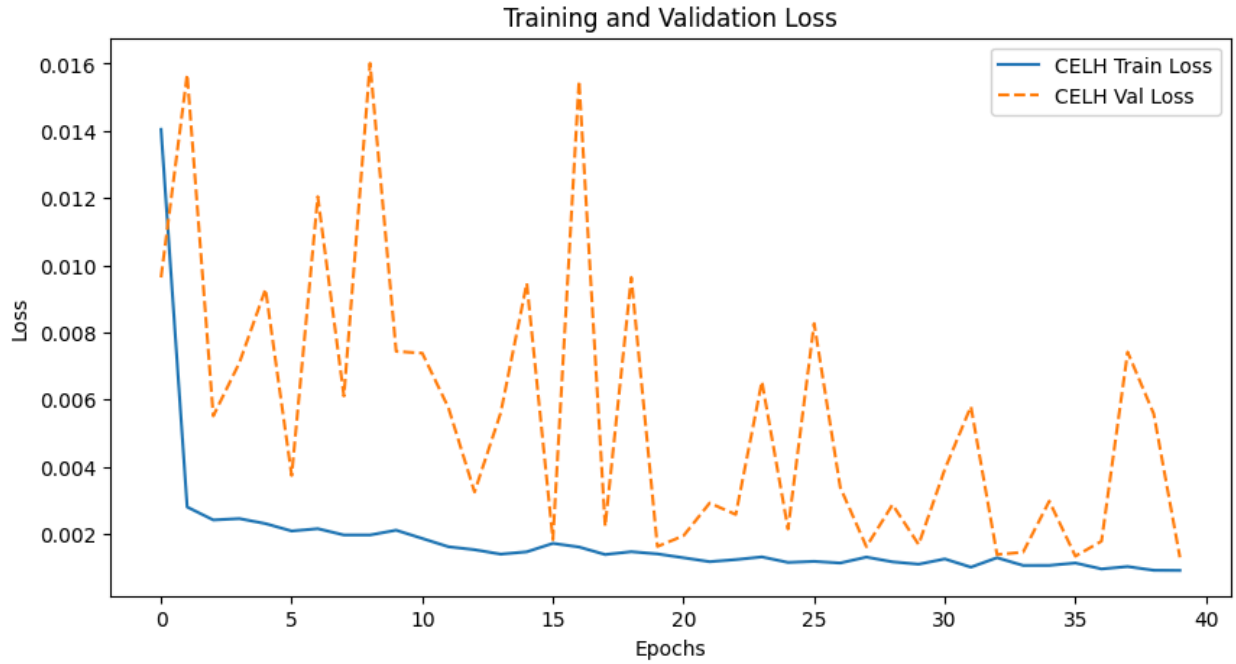
The proposed deep learning model provides a robust and efficient approach to stock market prediction. The combination of BiGRU and LSTM achieves high predictive accuracy, making it a valuable tool for investors and analysts. Future work could involve optimizing the model further and integrating additional features such as sentiment analysis from financial news.

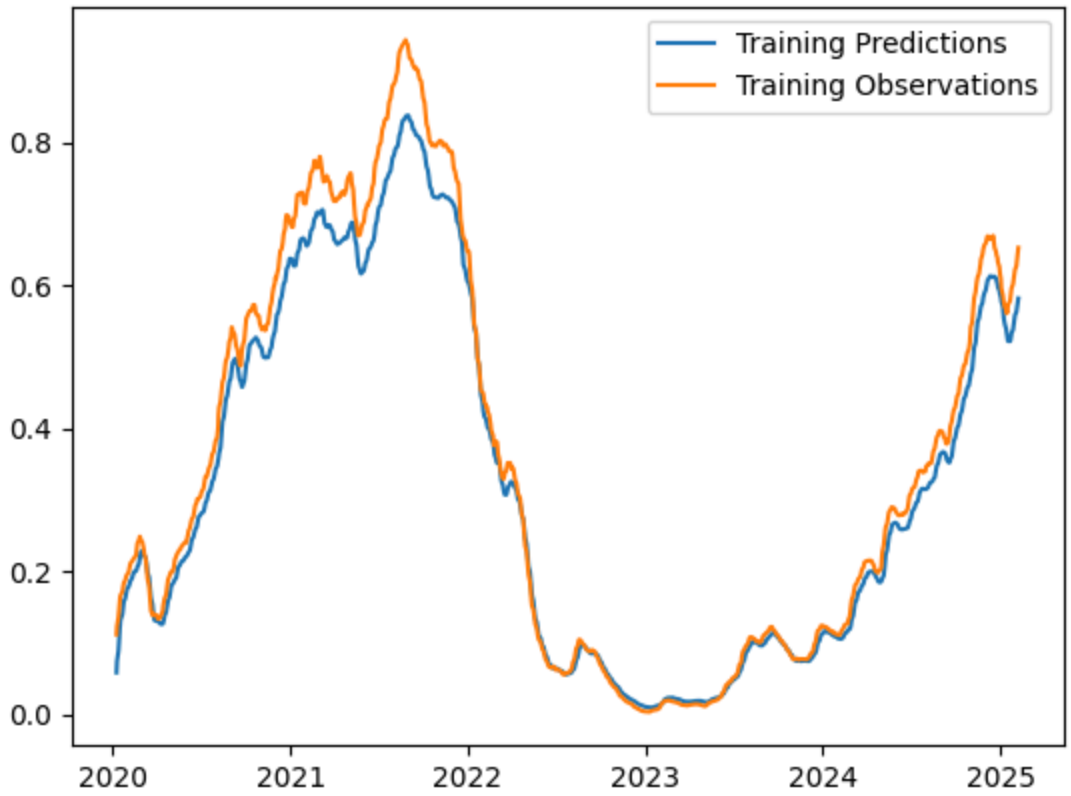
Figures:





CELH - MAE: 1.5638078792974413, MSE: 4.834869687976275, RMSE: 2.19883371085134, R2: 0.9372214026296727




Training Predictions
Training Observations
0.8
0.6
0.4
0.2
0.0
2020
2021
2022
2023
2024
2025