Stock Prediction

AIM

- In my work, I compared the performance of four different machine learning models, namely Long Short-Term Memory (LSTM) Networks, Gated Recurrent Units (GRU), Convolutional Neural Networks (CNN), and Random Forest, in predicting stock prices using time series data.

LSTM

- Long Short-Term Memory Networks
- It is a type of recurrent neural network (RNN)
    - It captures long-term dependencies in time series data so well-suited for stock prediction tasks involving sequential data.

The best LSTM configuration had the following parameters:

- Best LSTM RMSE: 0.02322727933710564
- Best Sequence Length: 15
- Best Epochs: 200

GRU

- Gated Recurrent Units
- It is also a type of RNN
    - It requires fewer parameters than LSTM networks
- It captures temporal dependencies, making them suitable for predicting stock prices.
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The best GRU configuration had the following parameters:

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- Best GRU RMSE: 0.02308415804854275
- Best Sequence Length: 15
- Best Epochs: 150
```

CNN

- Convolutional Neural Networks excel at detecting local patterns in data
- It can be adapted for time series analysis by treating temporal sequences as 1D data
- It is a good choice for capturing short-term dependencies in stock data.

The best CNN configuration had the following parameters:

- Best LSTM RMSE: 0.04681689789910629

- Best Sequence Length: 15
- Best Epochs: 150

Random Forest

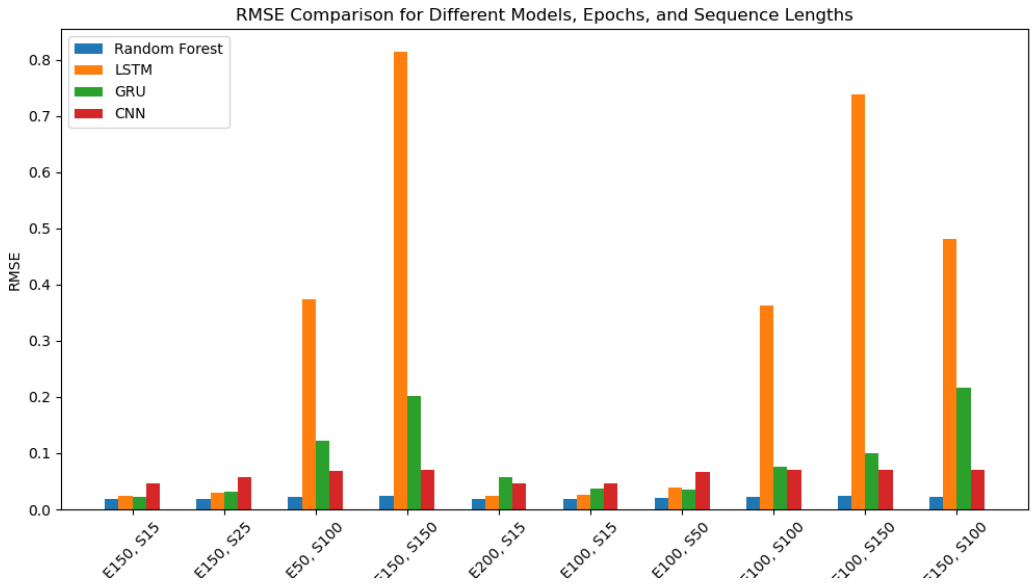
- It is a powerful ensemble method that constructs multiple decision trees
- It aggregates their results, providing robust and stable predictions for stock prices
- It is good when dealing with noisy or missing data.

The Random Forest scores:

- Best RMSE: 0.01920465563497243
- Best MAE: 0.11809418378518596

Chart

RMSE Comparison for Different Models, Epochs, and Sequence Lengths



- Check results folder for more charts

Best Model

- **Best Model:** Random Forest
- **Best RMSE:** 0.01920465563497243
- **Best MAE:** 0.11809418378518596

Conclusion

- Based on the results obtained, the Random Forest model outperformed the other models with the lowest RMSE of 0.01920465563497243 and MAE of 0.11809418378518596, indicating its robustness and stability when dealing with noisy or missing data.
- GRU came in second, with an RMSE of 0.02308415804854275, followed by LSTM with an RMSE of 0.02322727933710564.
    - Both LSTM and GRU models demonstrated their ability to capture long-term dependencies in time series data.
- CNN had the highest RMSE of 0.04681689789910629, highlighting its suitability for capturing short-term dependencies in stock data.
- In conclusion, the Random Forest model was found to be the best model for stock price prediction among the four models compared in this study.