# Predicting Stock market trends with Recurrent Networks

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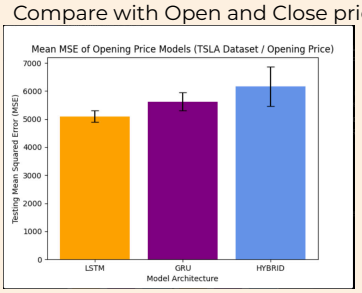
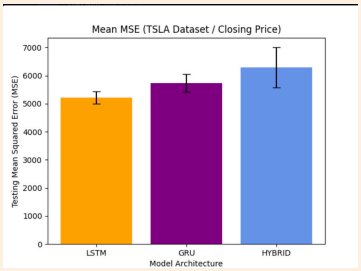
## Abstract

Our goal was to predict the trend of the stocks from open datasets (Tesla, Amazon, Apple)
We aimed to find the best regression model for predicting the stock market price.
We used the Yahoo! finance historical Statistics data to train two different regression models (An LSTM and an a GRU architecture)
We used the stock prices of 3 different companies: Tesla, Apple, and Amazon.
We compared the average Mean Squared Error of each architecture.
In this study, we found that LSTMs were more performant than GRUs and Hybrid

## Result Plot

Compare with Open and Close price




## Results

- In research, we tried with 3 different data set: Tesla, Apple, and Amazon for confident we pick the Tesla result for the representative.
- As these 3 different regression model(architectures) : LSTM, GRU, and LSTM + GRU give 3 different result.
- As this plots is shown LSTM shows the least standard deviation and the least MSE when we trained with the Open price.
- As this plots is shown LSTM shows the least standard deviation and the least MSE when we trained with the Close price.

## Method

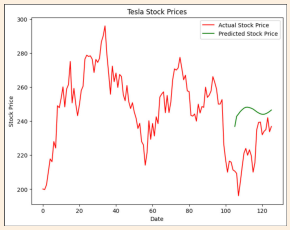
### LSTM

- LSTM excels at capturing long-term dependencies, making it ideal for sequence prediction tasks
- LSTM Adds the another Gates which GRU does not have which name “forget Gate” (forget input and output get)
- LSTM has better stability compared to GRU.

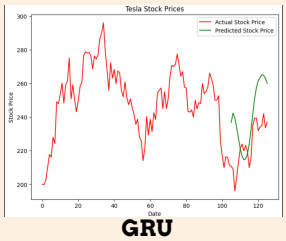
### GRU

- GRU is one of the network after LSTM which handles recurrency by implementing 2 types of the Gate.
-But GRU has the Weakness which is short memory and, Exploding and vanishing gradients. (it goes infinite value or very high value which means it updates the weight with very small numbers)
- GRU is difficult to implementing the back propagation.

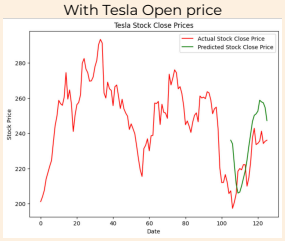
**LSTM + GRU**
With Telsa Open price




**LSTM**
With Tesla Open price




**GRU**
With Tesla Open price




## Conclusion

- We conclude that LSTM and GRU possess the strong ability to model sequential data.
- LSTM appears to have stronger performane than GRUor Hybrid model.
- -We might also need to train with different features and different stock
- - Models were very senstive to hyperparmeters.

## References

LSTM Definition
https://www.analyticsvidhya.com/blog/2021/03/introduction-to-long-short-term-memory-lstm/
Explanation for the GRU
https://datascience.stackexchange.com/questions/14581/when-to-use-gru-over-lstm
Dataset
https://finance.yahoo.com/quote/TSLA/history?period1=1669593600&period2=1701129600&interval=1d&filter=history&frequency=1d&includeAdjustedClose=true