

I did four models for each lag1, lag7, lag14.

Model1: 4 SimpleRNN layer with the output dense layer

Model2: 4 LSTM layer with the output dense layer

Model3: 6 LSTM layer with the output dense layer

Model4: 4 GRU layer with the output dense layer

I used 'adam' as the optimizer and 'mean\_squared\_error' as the loss, I trained the model for 100 epoch and made the prediction until Oct-17-2020. Since the true data is until June, for all future data, I used the prediction to put into the model for future prediction.

Here is the model performance:

1. In terms of the training time:

	<i>lag1</i>	<i>lag7</i>	<i>lag14</i>
4 * <i>SimpleRNN</i>	265.985345	206.353891	142.953459
4 * <i>LSTM</i>	390.293636	390.111862	330.186210
6 * <i>LSTM</i>	577.824176	515.365424	470.694139
4 * <i>GRU</i>	511.080844	329.904193	329.164676

We can see that the SimpleRNN has the shortest training time, increasing the number of LSTM layer will also increase the training time by same factor. The training time for GRU is similar with same number of layer of LSTM, even though in class we learned that there should be less parameters in GRU structure.

[continue on next page]

2. In terms of the model performance:

The red line is the true stock price, blue line is the predicted stock price, and the blue dashed line is the future prediction without true data.

The display of the image is following this sequence:

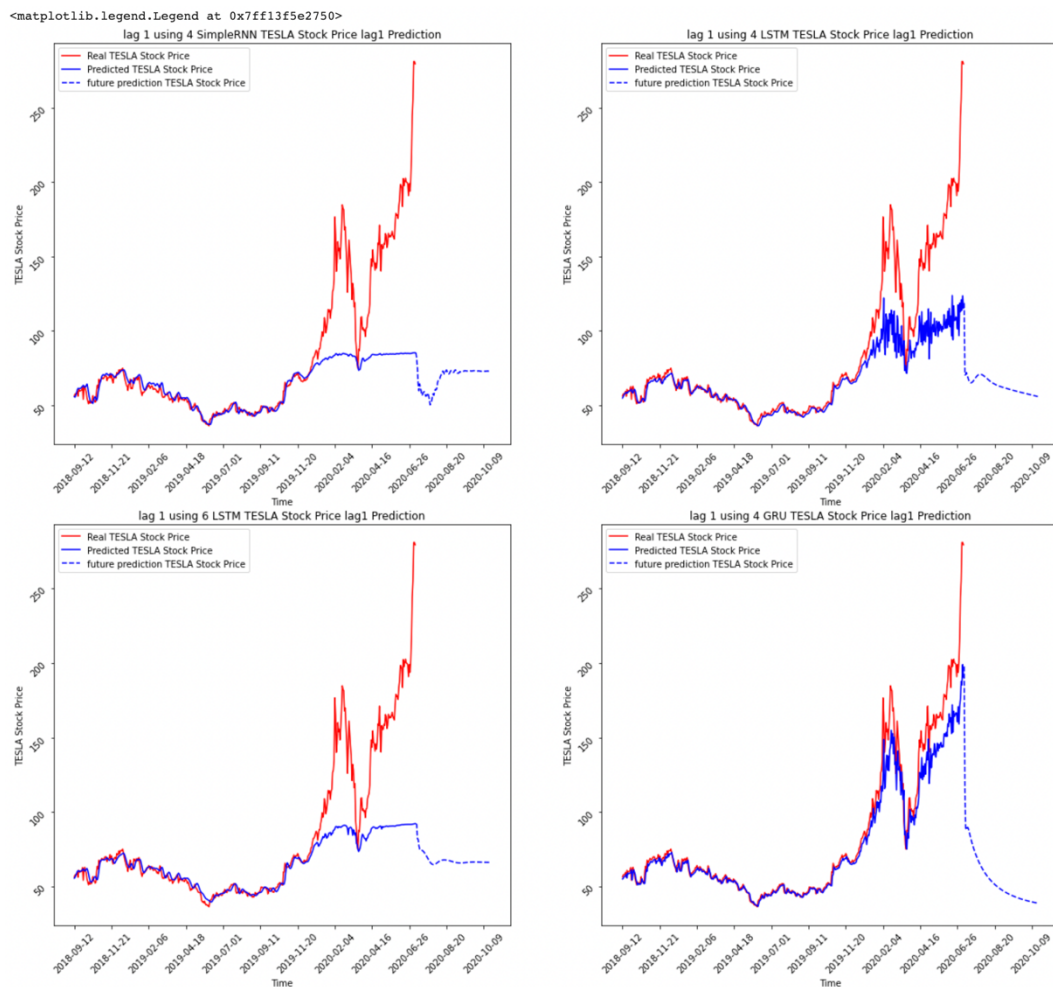
Top left: 4\*SimpleRNN

top right: 4\*LSTM

Bottom left: 5\*LSTM

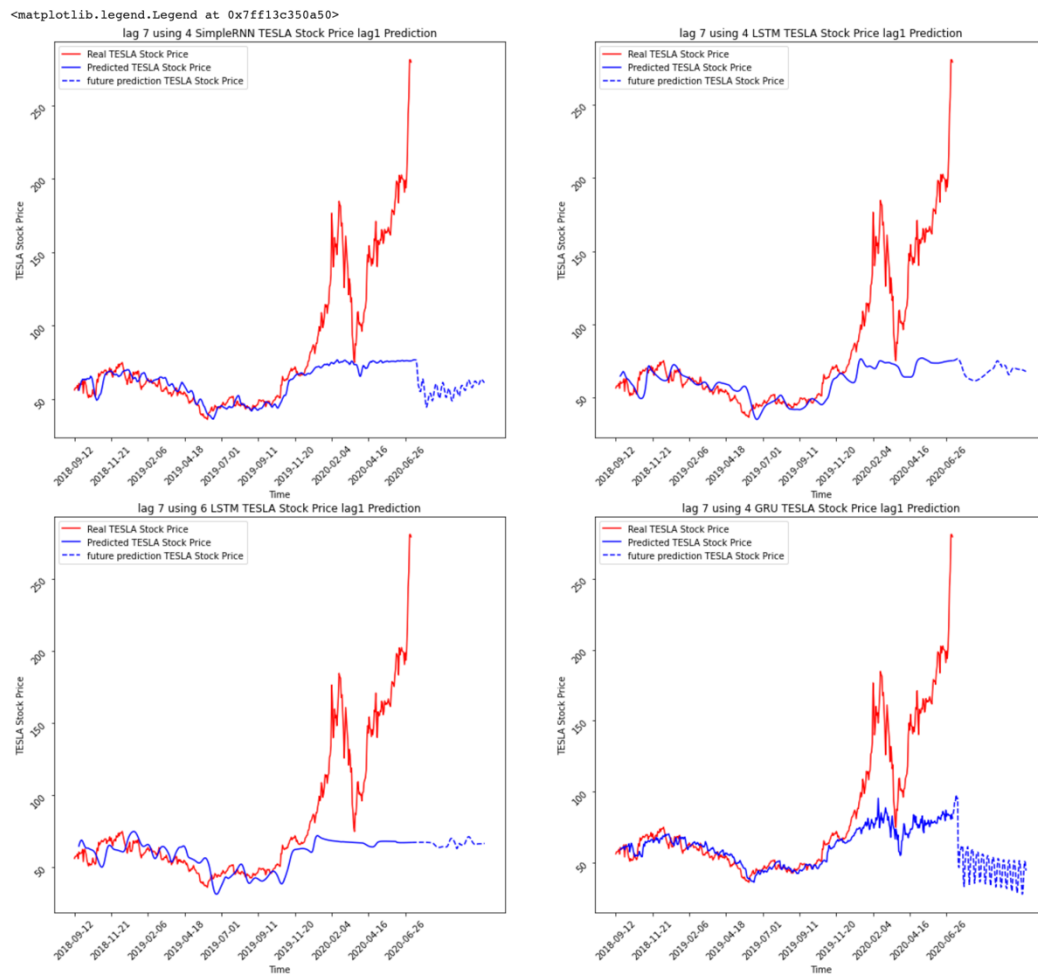
bottom right: 4\*GRU

For lag1:



We can see that the GRU is working the best when we still have true data as the predictor. However, when we start to use the predicted data as the predictor, the performance of GRU also fell down very quick. The second better model would be the 4\*LSTM model.

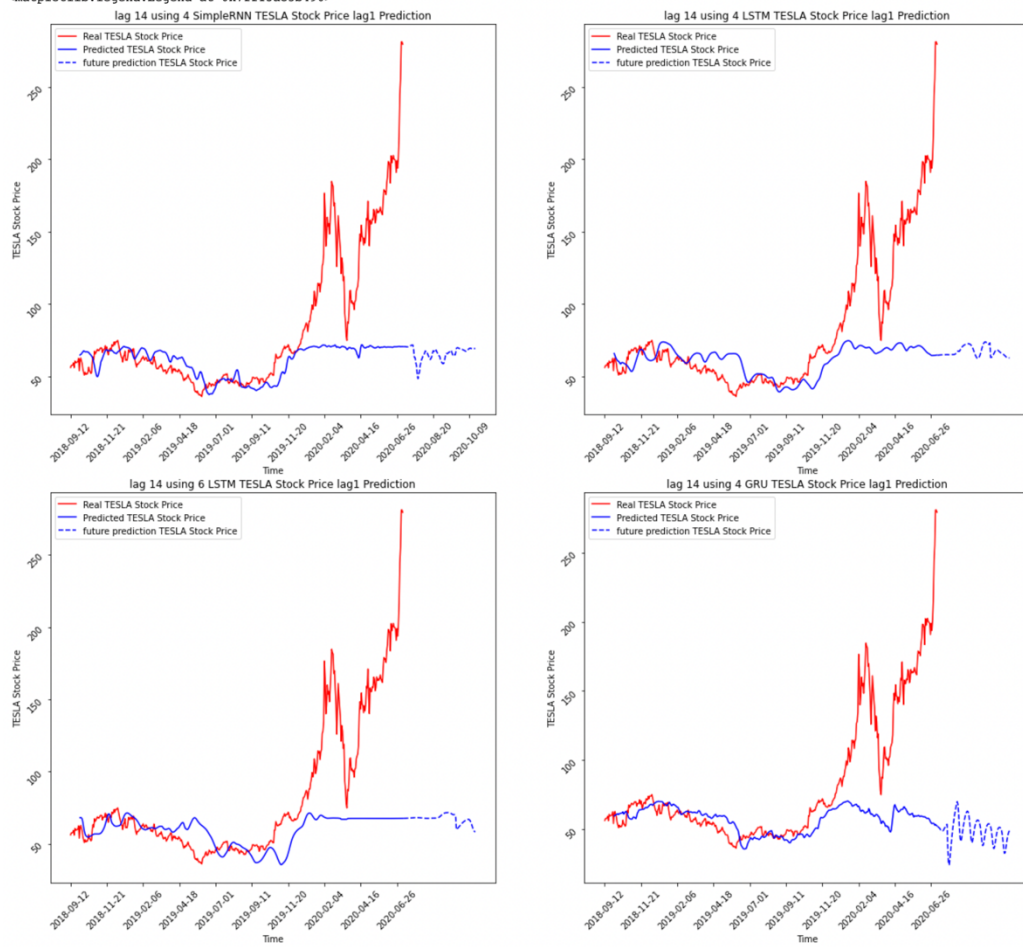
For lag7:



We can see when we do the lag7 prediction, GRU model worked the best but the model performance is worse than when we do lag1 prediction. It is reasonable because the longer future we are predicting for, the more uncertainty there is. In the general, the four models are all working well in the first half of the data, when there started to have some sort of the increasing in the stock price, the model seems hardly captured the increase.

For lag14:

<matplotlib.legend.Legend at 0x7ff13ac5b490>



For lag14 prediction, we can see the result is even worse than the lag7 prediction, but among the 4 model, GRU is still performing the best among the four models.