Assignment-3

Time-Series Data

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The "Simple LSTM-Based Model" outperformed all other models, including the more intricate ones and the Naïve Method, with the lowest MAE score of 2.57. This shows that the model performs better than the other models listed because it offers the most accurate predictions for the specified dataset.
Models that combine convolutional layers with RNN and stack RNN layers, on the other hand, exhibit higher MAE values, suggesting that they might not be appropriate for the task. The unique qualities and specifications of the dataset and task should guide the choice of model architecture. To improve model performance, more optimization and hyperparameter tuning might be required.

Introduction:

Applying recurrent neural networks to time series data can have a few benefits and applications. RNNs are particularly useful for analyzing and modeling time series data because of their ability to handle sequential data and their ability to capture temporal dependencies.
I began working on the assignment by uploading the temperature forecasting dataset from amazonaws.com, which is a website owned by Amazon Web Services. The code reads the file, extracts its contents, and prints the number of rows and variables. I then received the following results:

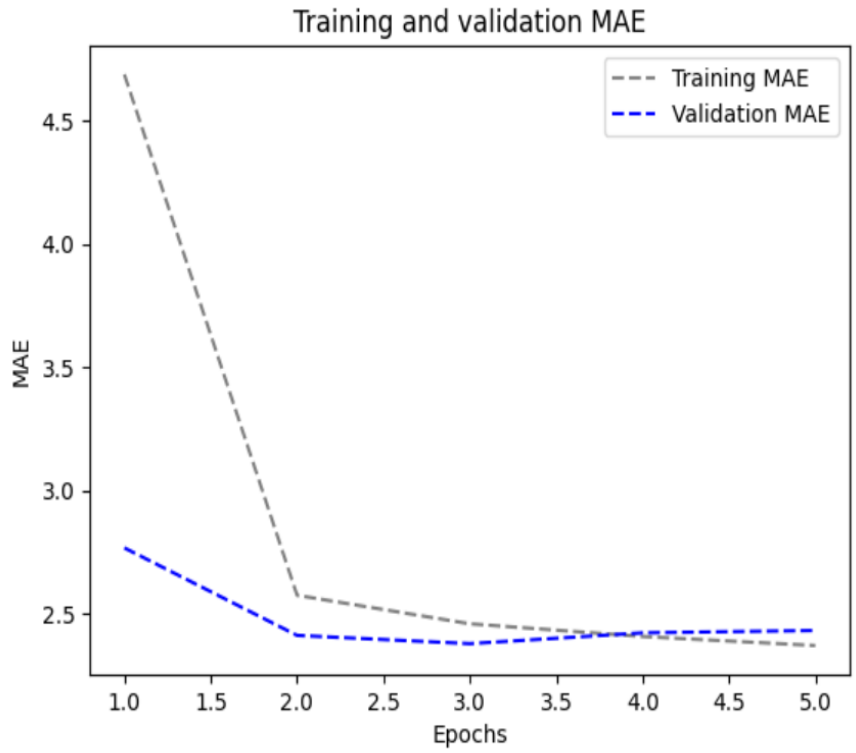
In the context of the analysis:

MODELS	TEST MAE
Densely Connected Network Model	2.67
1D Convolutional Model	3.27
Simple RNN	3.33
Stacking RNN Layers	9.90
GRU	2.51
Simple LSTM Model	2.55
Stacked LSTM- Based with 16 units	2.51
Stacked LSTM- Based with 32 units	2.70
Stacked LSTM- Based with 8 units	2.55

LSTM-Dropout, Stacked Model	2.61
ID Convolutional And LSTM	3.93
Combined 1D Convolutional with RNN Model	3.85

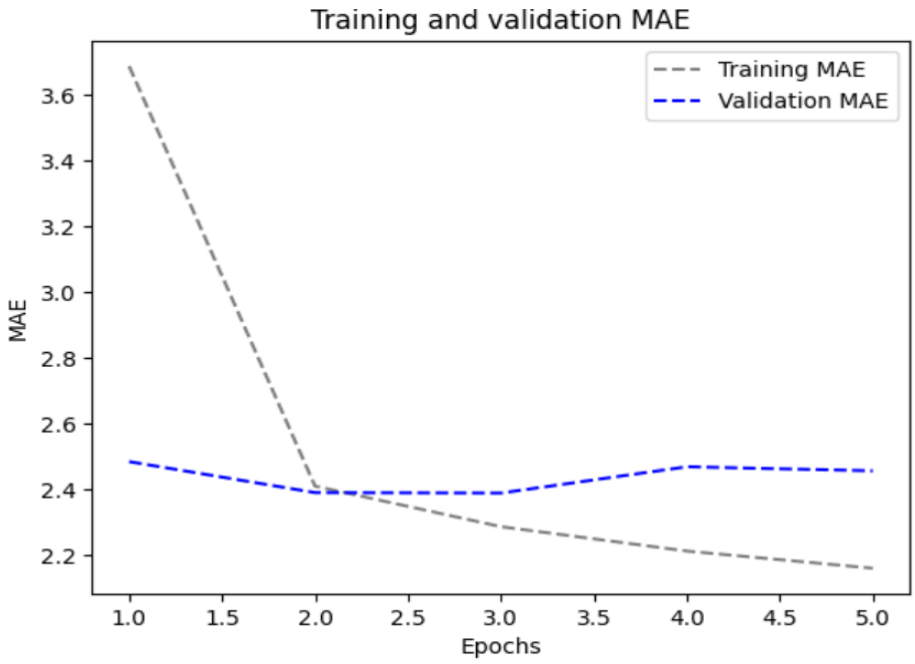
The Rise of the GRU:

In response to the limitations of the fundamental RNNs, Gated Recurrent Unit (GRU) models were created. GRUs, an RNN variant, were discovered to be the best-performing models, with an MAE of 2.51. Compared to LSTM (Long Short-Term Memory) models, GRUs efficiently record long-term dependencies in sequential data while requiring less processing power.

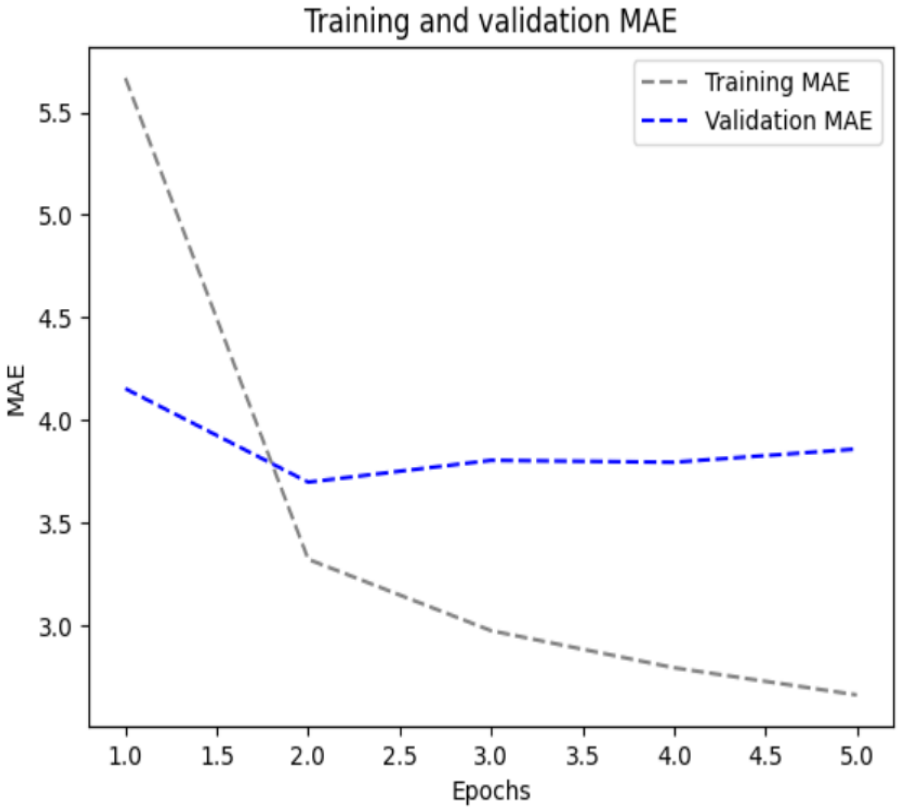


Optimizing LSTM:

Research on Long Short-Term Memory (LSTM) models, which are well-known for their effectiveness in handling time-series data, was carried out concurrently. Six distinct LSTM models were created, each with a different number of units in the recurrent layer stacking. The eight-unit layout turned out to be the most efficient, with an MAE of 2.55. LSTM



ID Convolutional And LSTM:



Conclusion:

In conclusion, LSTM and GRU designs were thoroughly examined, with GRU turning out to be the best option. To optimize GRU performance, key hyperparameters including the total number of units in stacking recurrent layers, the recurrent dropout rate, and the use of bidirectional data should be set appropriately.