Zeham Management Technologies BootCamp

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Predicting Traffic Flow Project

GROUP 4

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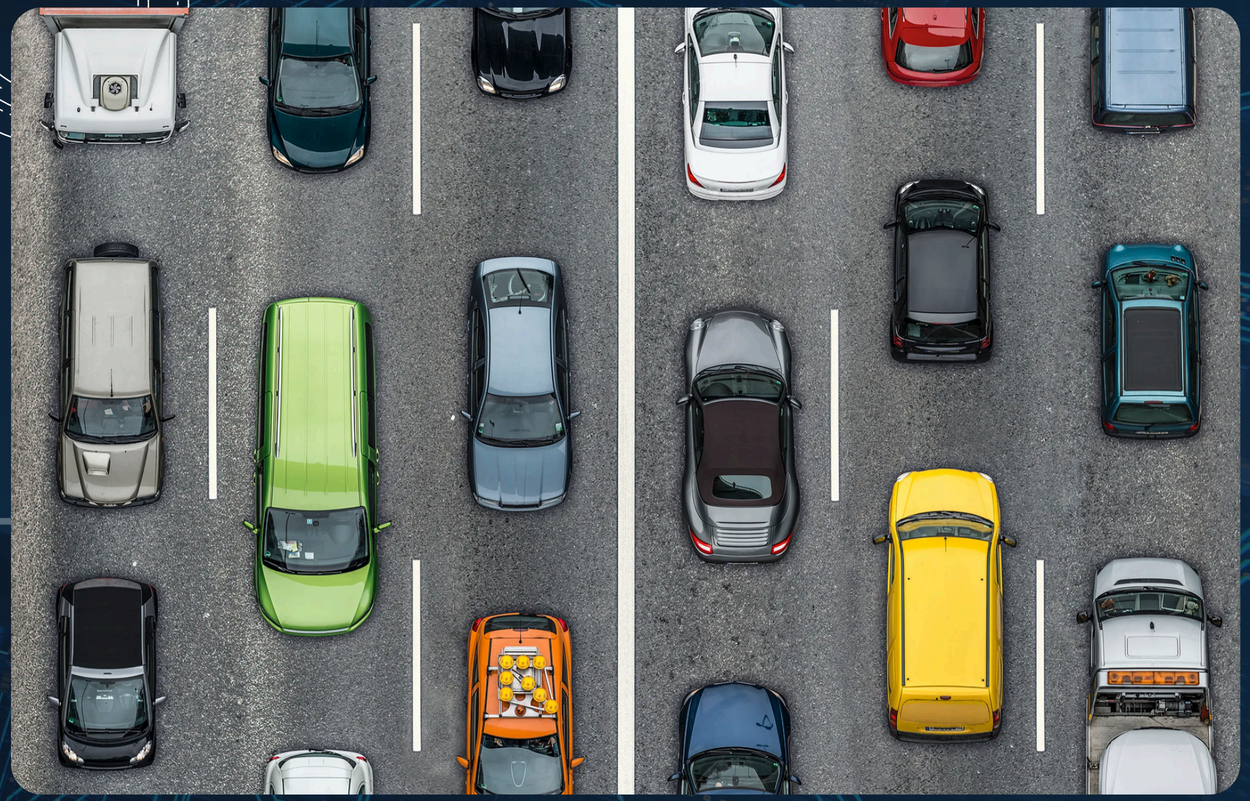
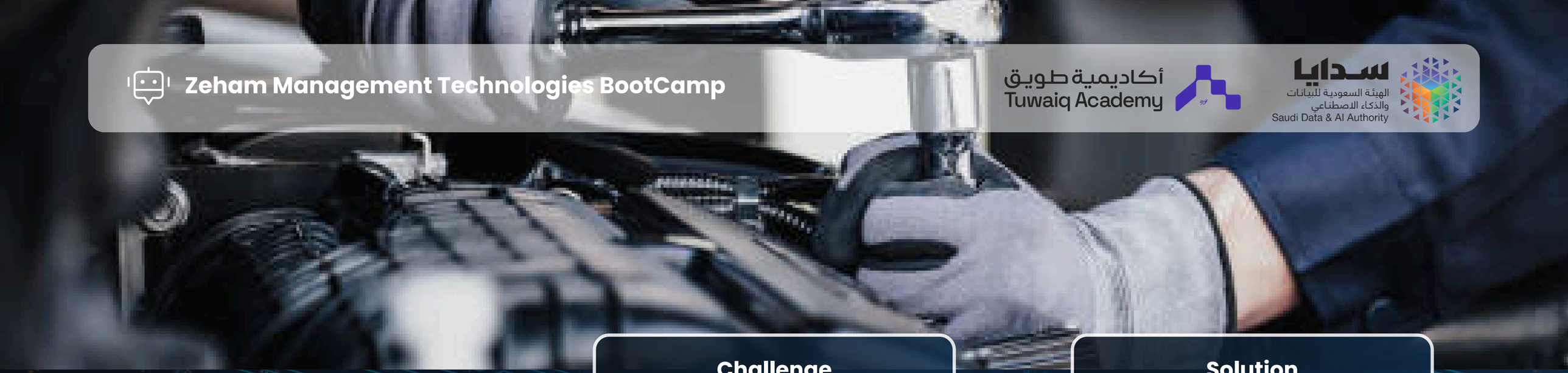
Introduction

Traffic congestion is a persistent problem in urban areas, impacting commutes, the environment, and overall quality of life. This project proposes a novel approach to predicting traffic speed based on a simple, yet powerful, indicator the speed of vehicles on the road.





Challenge VS Solution

Challenge

Traffic congestion is a persistent problem in urban areas, impacting commutes, the environment, and overall quality of life. Traditional methods for predicting traffic speed rely heavily on real-time sensor data, which can be expensive and prone to errors.

Solution

Predicting traffic speed based on indicator the speed of vehicles on the street. When the speed of off-street vehicles exceeds a certain threshold (in our case, 30), it indicates a higher likelihood of slower traffic speeds. Conversely, a lower off-street vehicle count suggests a faster flow of traffic.

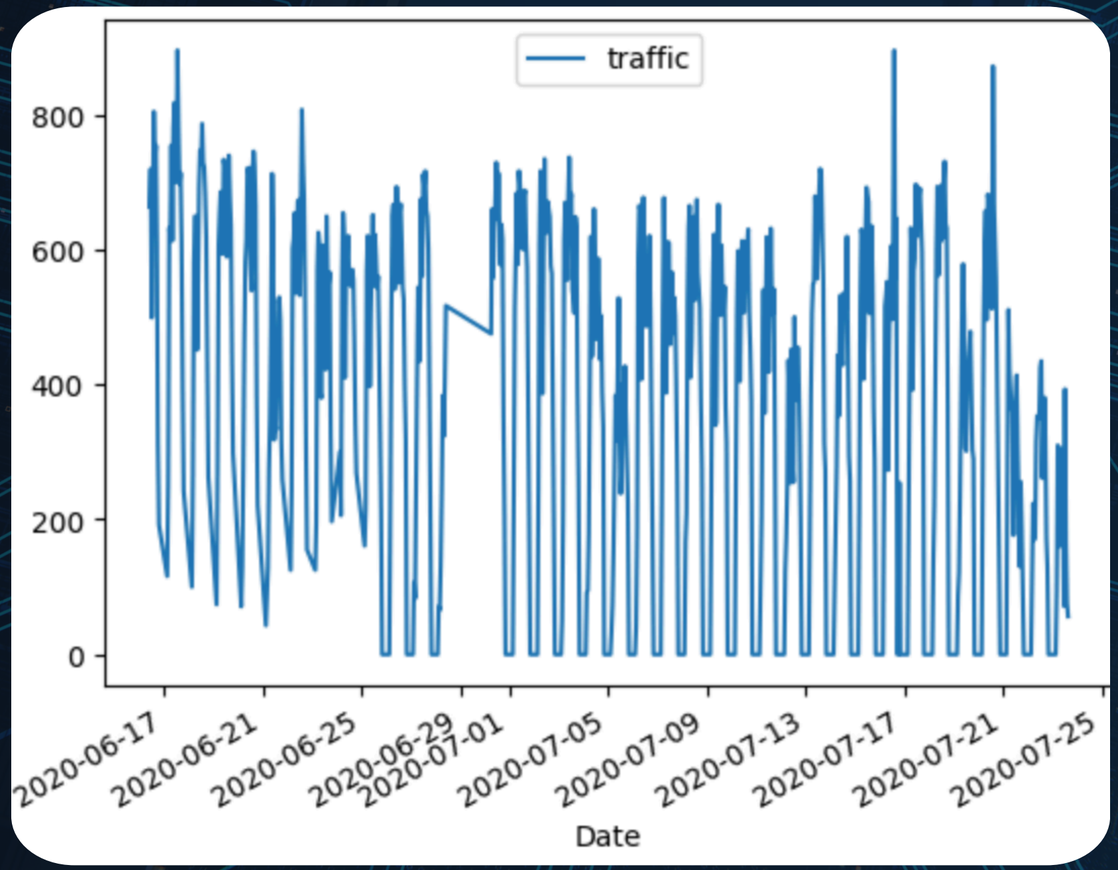
Dataset

Date	Bike	Car	Lorry	speed_00	speed_10	speed_20	speed_30	speed_40	speed_50	speed_60	traffic
2020-06-11 16:00:00+00:00	0.0	24.0	0.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0	24.0
2020-06-16 10:00:00+00:00	63.0	682.0	0.0	210.0	242.0	158.0	53.0	11.0	11.0	0.0	663.0
2020-06-16 11:00:00+00:00	56.0	747.0	0.0	131.0	230.0	266.0	92.0	11.0	4.0	4.0	719.0
2020-06-16 12:00:00+00:00	45.0	539.0	0.0	171.0	92.0	168.0	68.0	15.0	13.0	8.0	499.0
2020-06-16 14:00:00+00:00	125.0	820.0	0.0	322.0	365.0	102.0	15.0	8.0	5.0	3.0	804.0

These data come from a camera that is part of the Telraam device which makes counting cameras available to interested citizens, from **Kaggle.com**.

(we created a [traffic] column to SUM cars in speed 0 - 30 to Predict the speed of off-street vehicles exceeds a certain threshold (in our case, 30), it indicates a higher likelihood of slower traffic speeds. Conversely, a lower off-street vehicle count suggests a faster flow of traffic.)

Visualization



LSTM

Model Summary

Model: "sequential_4"

Layer (type)	Output Shape	Param #
lstm_3 (LSTM)	(None, None, 32)	4,352
lstm_4 (LSTM)	(None, None, 64)	24,832
lstm_5 (LSTM)	(None, 128)	98,816
dropout_4 (Dropout)	(None, 128)	0
dense_4 (Dense)	(None, 1)	129

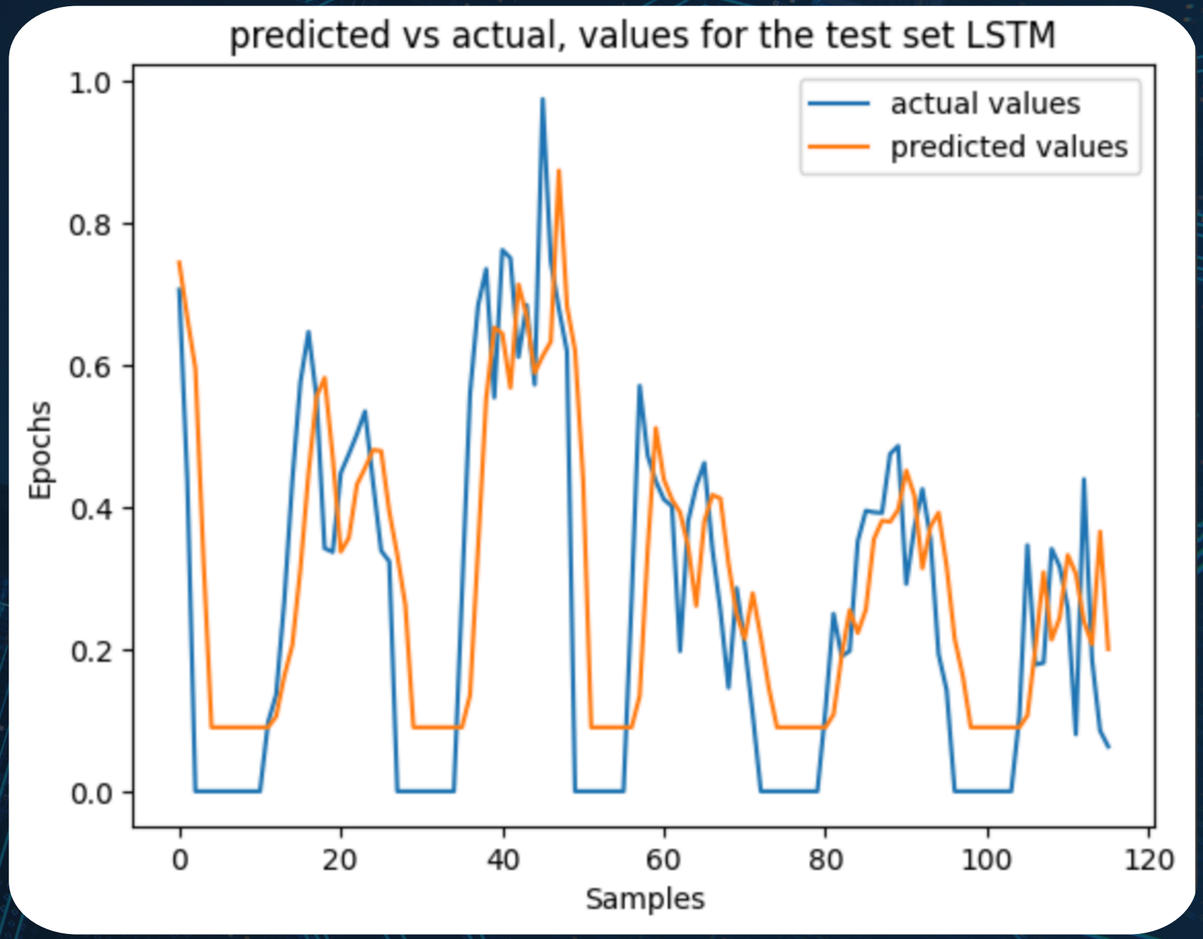
Total params: 384,389 (1.47 MB)
Trainable params: 128,129 (500.50 KB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 256,260 (1001.02 KB)

Results

Evaluating LSTM Model

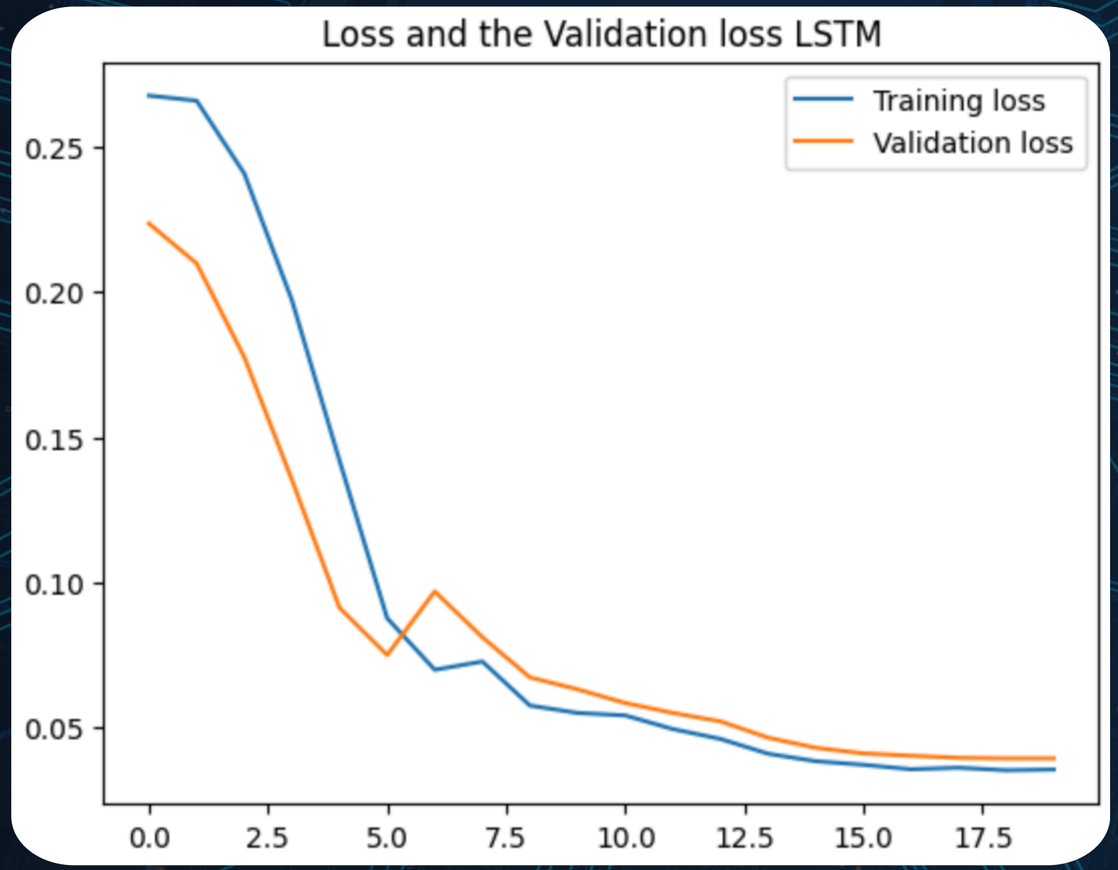
```
The value of MAE for LSTM: 0.1552
```

Visualize the result LSTM Model



Results

Visualize the loss (LSTM Model)



GRU

Model Summary

Model: "sequential_5"

Layer (type)	Output Shape	Param #
gru_3 (GRU)	(None, None, 32)	3,360
gru_4 (GRU)	(None, None, 64)	18,816
gru_5 (GRU)	(None, 128)	74,496
dropout_5 (Dropout)	(None, 128)	0
dense_5 (Dense)	(None, 1)	129

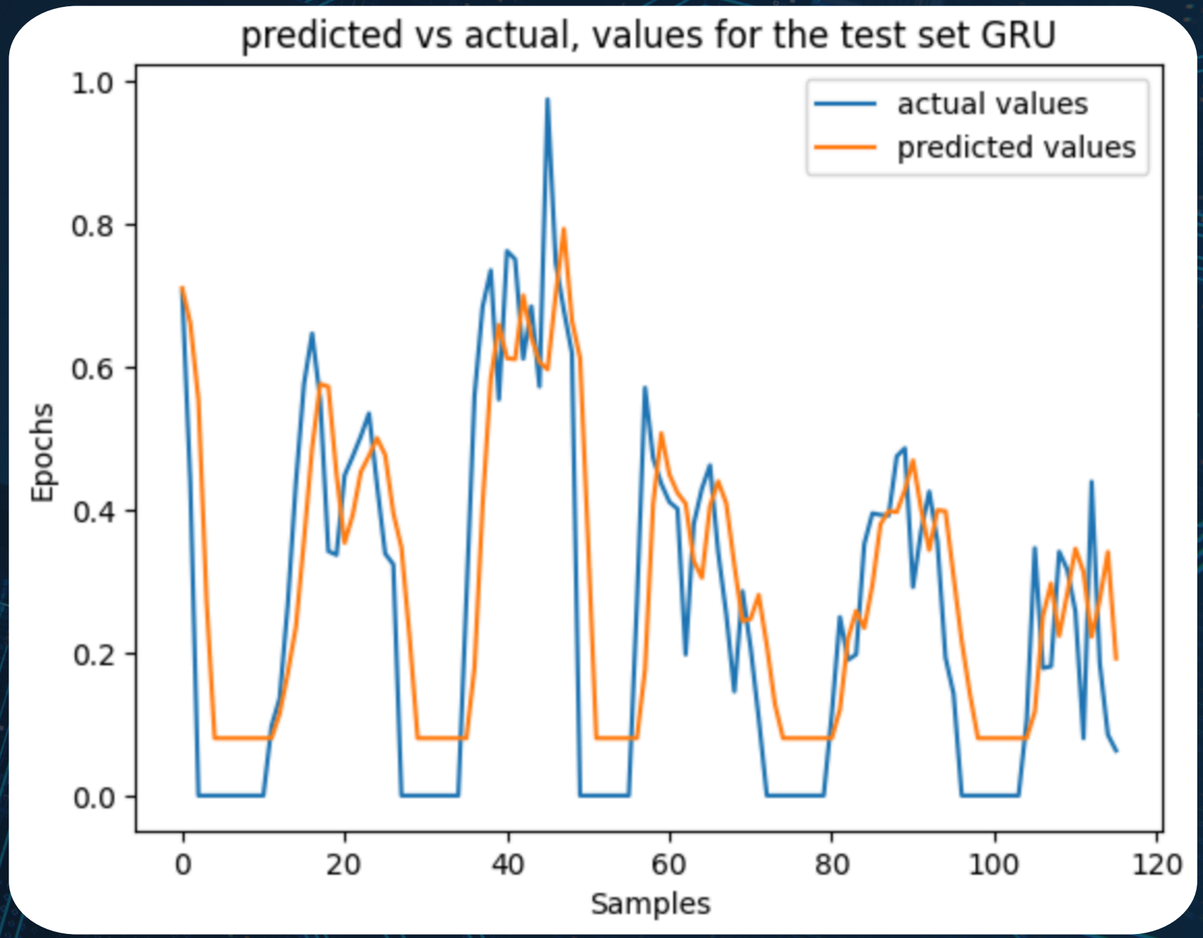
Total params: 290,405 (1.11 MB)
Trainable params: 96,801 (378.13 KB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 193,604 (756.27 KB)

Results

Evaluating GRU Model

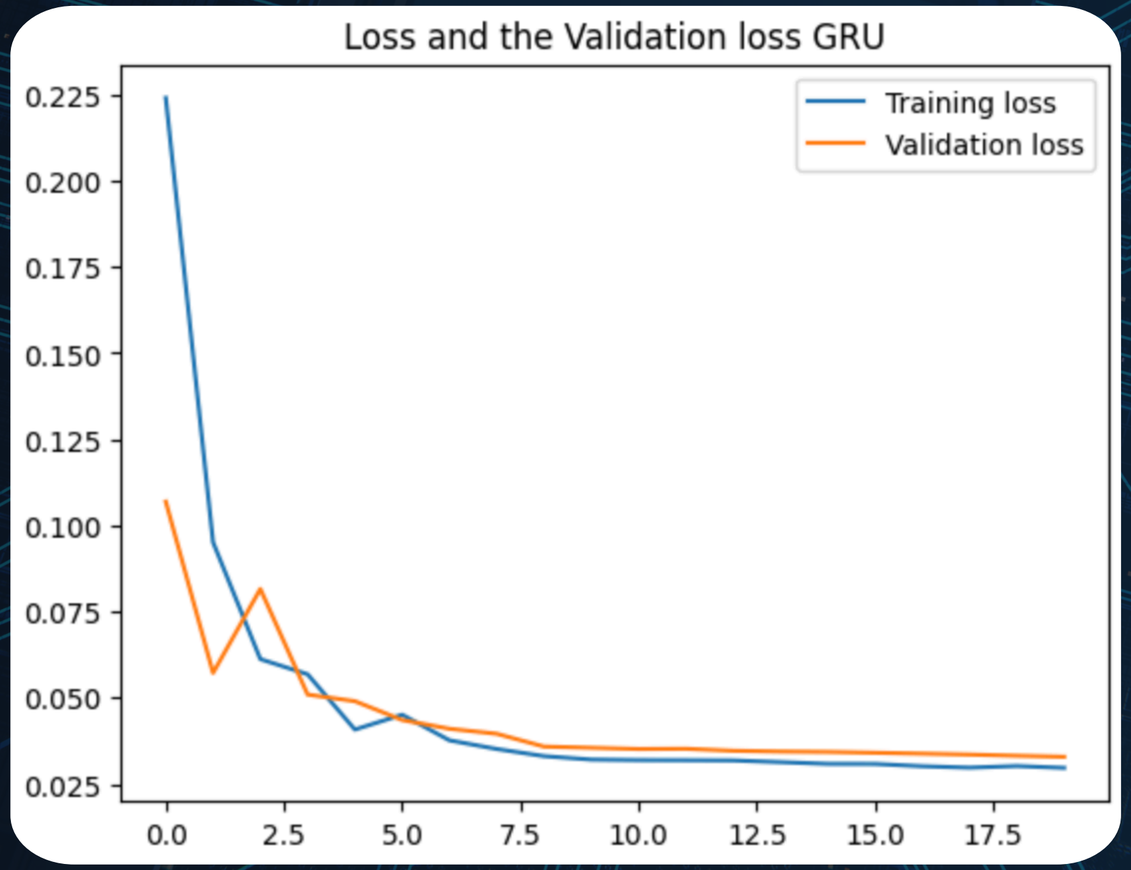
```
The value of MAE for GRU: 0.1422
```

Visualize the result GRU Model



Results

Visualize the loss (GRU Model)



RNN

Model Summary

Model: "sequential"

Layer (type)	Output Shape	Param #
simple_rnn (SimpleRNN)	(None, None, 32)	1,088
simple_rnn_1 (SimpleRNN)	(None, None, 64)	6,208
simple_rnn_2 (SimpleRNN)	(None, 128)	24,704
dropout (Dropout)	(None, 128)	0
dense (Dense)	(None, 1)	129

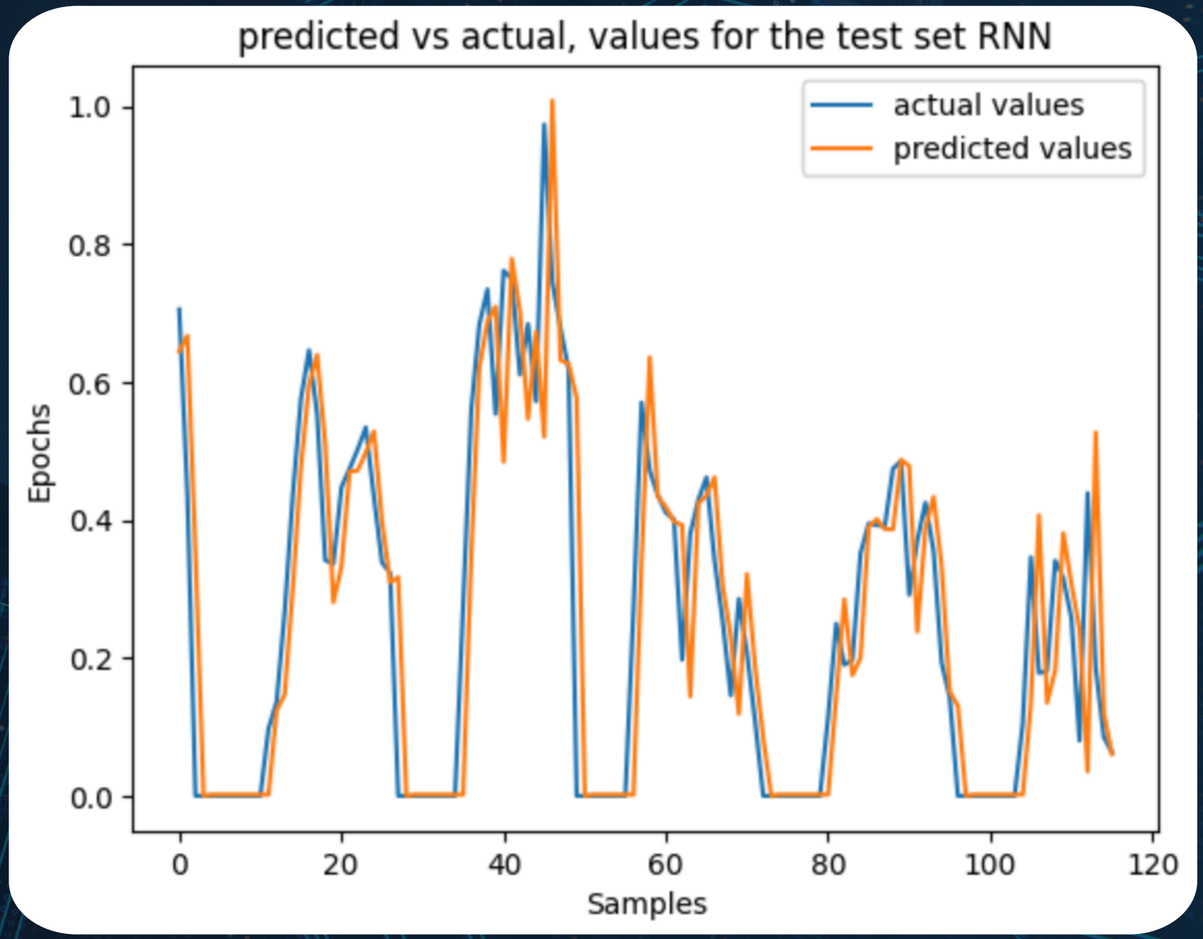
Total params: 96,389 (376.52 KB)
Trainable params: 32,129 (125.50 KB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 64,260 (251.02 KB)

Results

Evaluating RNN Model

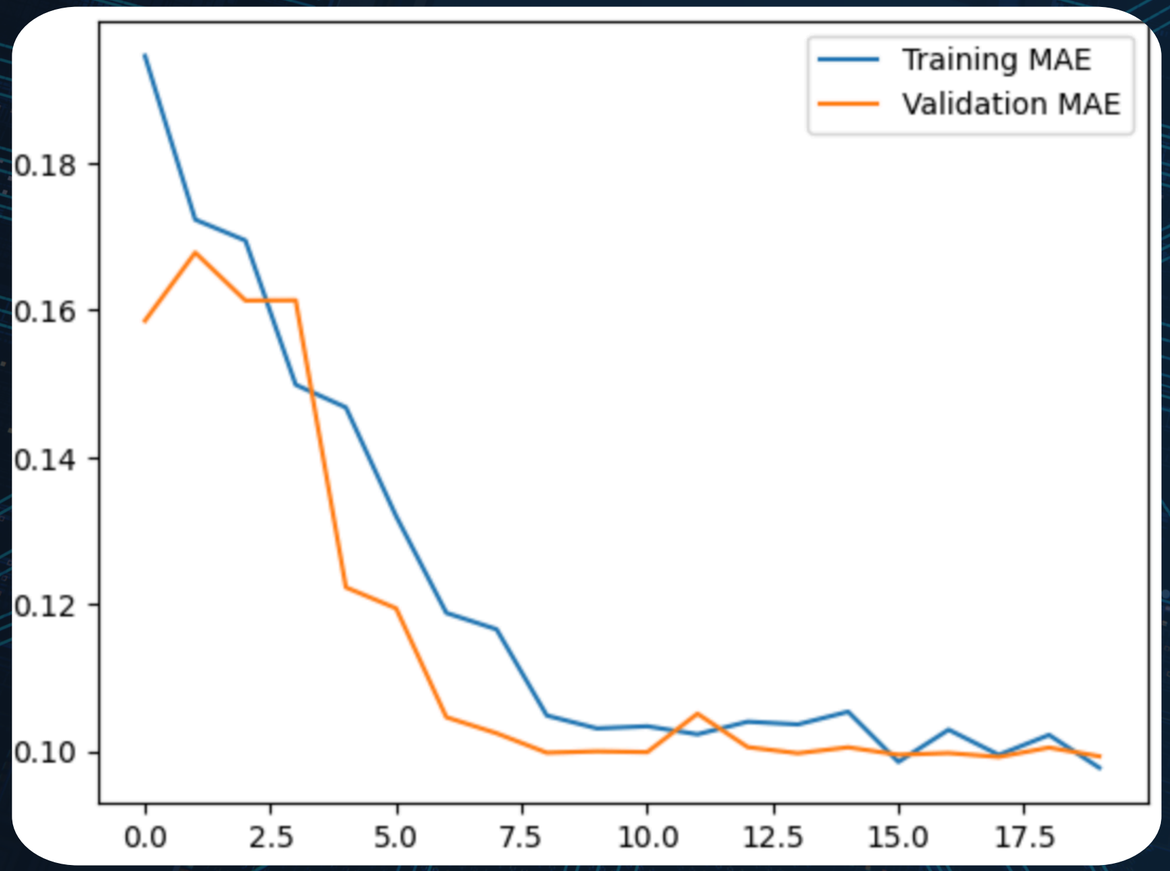
```
The value of MAE for RNN: 0.0993
```

Visualize the result RNN Model



Results

Visualize the loss (RNN Model)



- **What challenges did you face during data collection and how did you overcome them?**

  Data Availability and Quality.

- **Why did you choose your specific model architecture?**

  We preferred to compare different time series forecasting models (SimpleRNN, LSTM, and GRU) to see which one performs best.

- **How does the performance of your chosen model compare to alternative approaches, and what factors contributed to the differences?**

  We compare the 3 model by MAE (Mean Absolute Error)

- **If you were to extend this project, what additional features or improvements would you consider?**

  link to the Interactive Dashboard

Conclusion

By comparing the models' performance on Mean Absolute Error, We see the most suitable model for our traffic speed prediction task is RNN Model.

Thank You