Deep Learning on Traffic Prediction

DLTP - DTSA 5506

Photo by altexsoft.com[1]

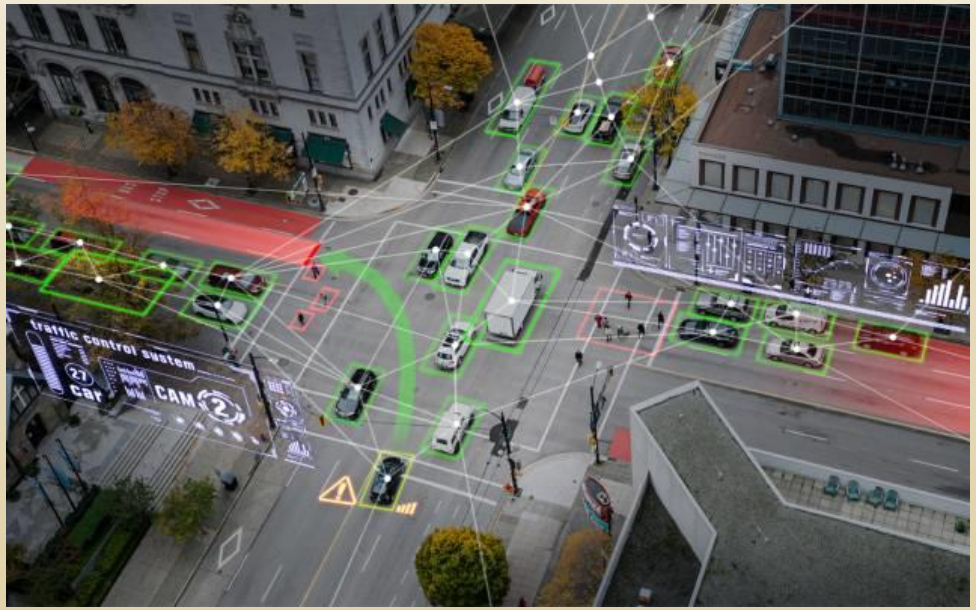


Photo by Seagate.com[2]

Abstract

This project presents a comparative analysis of Gated Recurrent Units (GRU) and Convolutional Neural Networks (CNN) for predicting traffic congestion in a time series problem.

Problem Statement

Traffic congestion is a significant issue in urban areas, leading to increased travel times, fuel consumption, and environmental pollution. Accurately predicting traffic jams can help transportation authorities implement proactive measures to mitigate congestion and improve traffic flow.

Relevant Previous Work

The notebook presented by Karnika Kapoor[3] applied GRU approach to predict traffic patterns across the four junctions. By preprocessing the data, including feature engineering and normalization.

Proposed Work

focusing on implementing CNN against GRU. Following same preprocessing that being performed bey Karnika Karpoor I have built a CNN model and applied it to predict the traffic volume at the specified junction.

Evaluation: RMSE

Using GRU	
Junction	RMSE
J1	0.2459
J2	0.5586
J3	0.6061
J4	1.0242

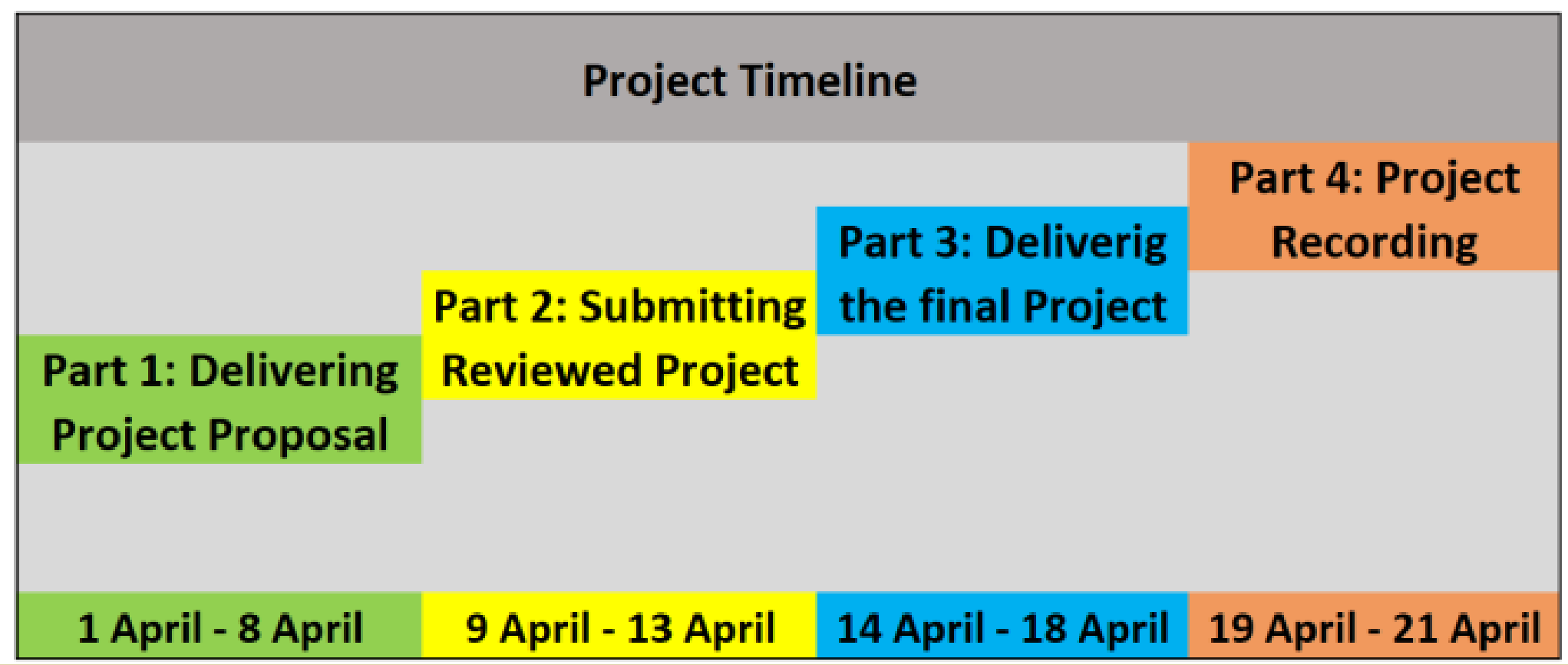
Using CNN	
Junction	RMSE
J1	0.2895
J2	0.5696
J3	0.6524
J4	1.1979

We observe that CNN approach has higher RMSE values than GRU[4], which means that referring to RMSE metric the proposed work performed relatively worse than the previous work.

Evaluation: Time Complexity

Fitting the GRU model took around 4 times to implement a one junction prediction. This indicates that even GRU is performing better it is significantly more complicated than CNN, and that is what exactly this study is aiming to reveal

Project Schedule



Conclusions

- GRU model is fitting the data better than the proposed CNN model in the context of RMSE evaluation metric for this traffic prediction project characterises
- CNN is significantly faster than GRU in terms of time complexity metrics
- Volume of Data is a key issue in such time series projects, where a model selection is needed to be carefully selected.

References

[1] Link to altex.com photo and article. Link
[2] Link to Seagate.com photo and article. Link
[3] Link to Karnika K.'s Kaggle notebook. Link
[4] Link to my notebook on GitHub. Link