Improving Traffic Load Prediction with Multi-Modality: A case of Brisbane

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MOTIVATION

- Fast, accurate traffic load prediction is important for Intelligent Transport System.
- During COVID-19, people prefer using private vehicles.
- Previous research works have been successful in many places such as the US [1] but not in Australia.
- Australia has unique characteristics such as more extreme weather and compulsory helmet while riding bikes.
- Social media platforms like Twitter contain an abundant range of news that can impact on traffic.
- Previous works predicting traffic only use news narrowed in one field.

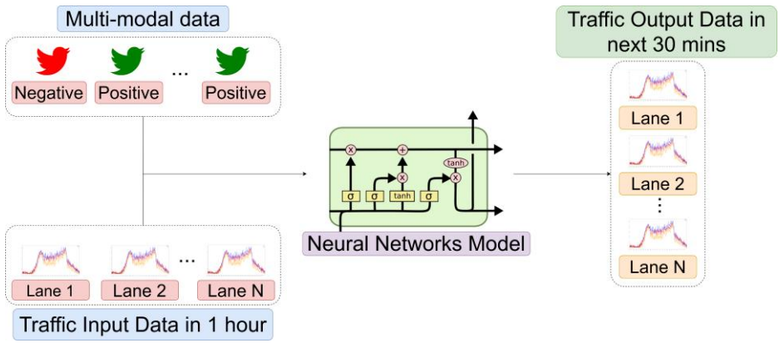
PROPOSED METHOD

- Being called as **Deep Multi-modal Traffic (DM2T)**.
- Using social media data (Twitter) to assist in predicting real-time traffic load.

REFERENCE

[1] Lazaris, A., Prasanna, V.K.: Deep learning models for aggregated network traffic prediction. In: 2019 15th International Conference on Network and Service Management (CNSM). pp. 1–5. IEEE (2019)

[2] Go, A., Bhayani, R., Huang, L.: Twitter sentiment classification using distant supervision. CS224N project report, Stanford 1(12), 2009 (2009)

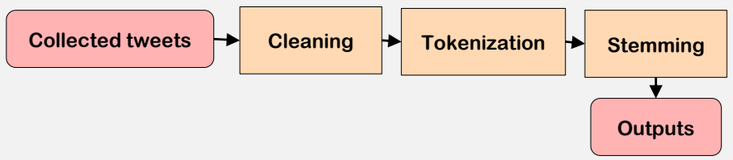


DM2T's conceptual framework

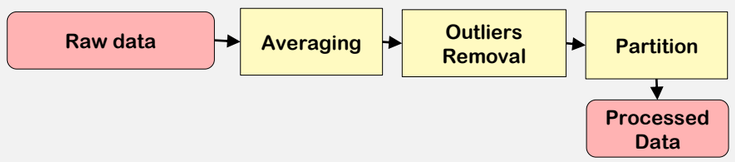
DATA PROCESSING

- Both data types were collected from Feb 20th 2021 to June 18th 2021.
- Traffic data was collected from Brisbane City Council

TWITTER DATA:



TRAFFIC DATA:



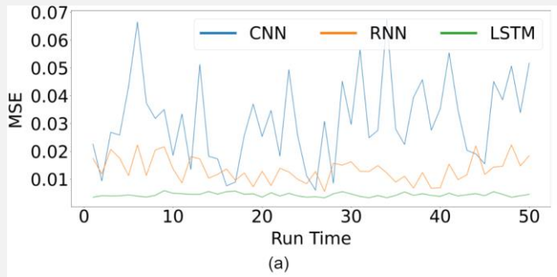
MULTI-MODAL DATA ANALYSIS

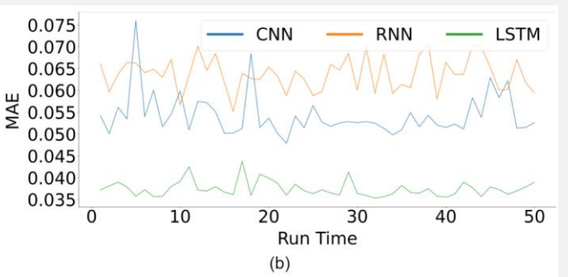
- **Idea:** analyzing sentiment of tweets.
- Using support vector machine (SVM) model.
- Training model on Sentiment 140 dataset [4].
- Counting number of positive and negative tweets for each 30-minute interval.

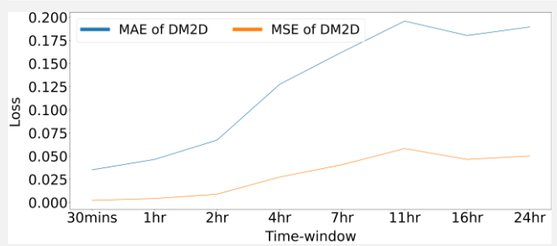
PREDICTING TRAFFIC EXPERIMENTS

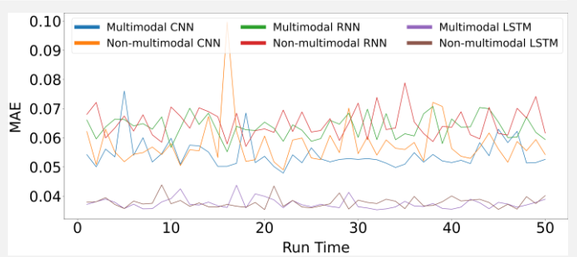
- Comparing models' performance with and without using multi-modal data.
- Using Long Short-term Memory (LSTM) as the base model.
- Comparing LSTM's performance with RNN and CNN models' performance.
- Experimenting approach's performance with different time window.

RESULTS









CONCLUSION & FUTURE WORKS

CONCLUSION:

- **DM2T** approach improves performance of all models.
- LSTM outperforms other models.
- Larger loss for wider time window.

FUTURE WORKS:

- Tuning hyper-parameter for LSTM model.
- Using other deep learning-based methods that is temporal-spatial aware.
- Experimenting the approach for other streets and other cities in Australia.