The use of Neural Networks for traffic volume forecasting

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Introduction

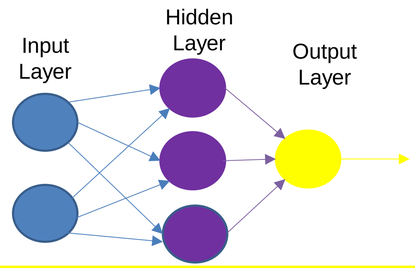
The availability of vehicle detection devices at strategic locations around the Western Cape Province, in South Africa, makes the collection of reliable and accurate traffic volume data possible. For this research an attempt will be made to improve traffic volume forecasting. A variation of Machine Learning algorithm known as **Neural Network**(NN) will be used to forecast values.

Objective

The main objective of this research is to design Neural Network models that can forecast traffic volume counts. The values forecasted by model will be compared with actual data collected by the vehicle detection devices.

Neural Networks

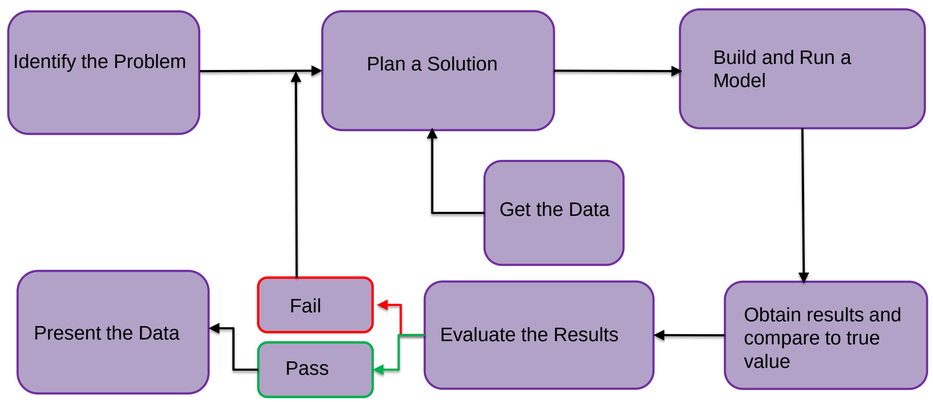
A Neural network is an algorithm that can go through large datasets and **find complex patterns** within a dataset .The model is structured in layers with each layer finding different patterns within the dataset. Traditional neural networks take inputs and moves them through each layer sequentially until processing is completed.



Methodology

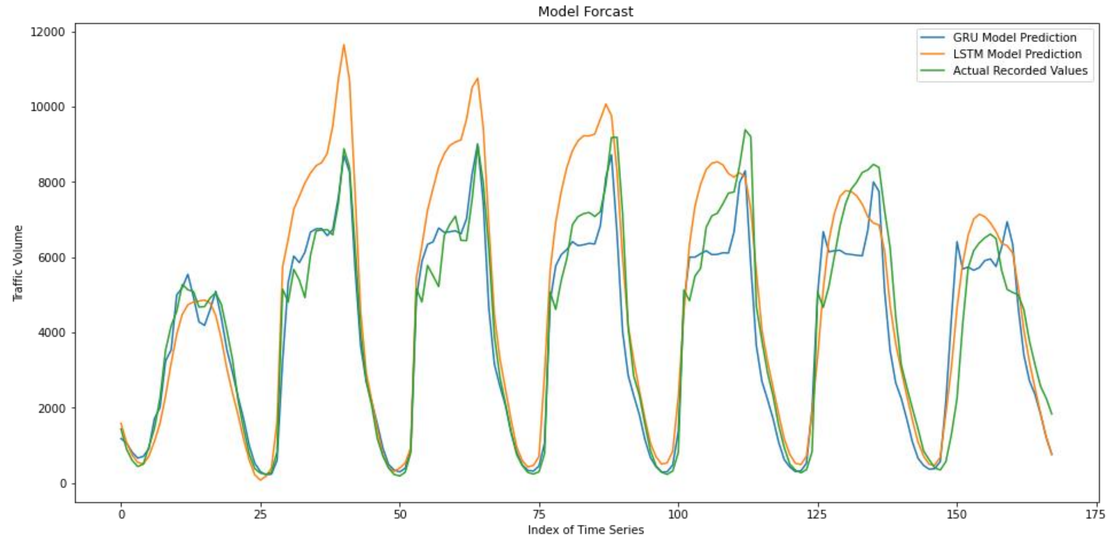
The research followed the following methodology.

- Data collected by vehicle detection devices was obtained.
- This data was converted to a form the models can use.
- To plan for a solution, a model architecture was designed and executed.
- The results were evaluated and compared to the actual values that were recorded by the vehicle detection devices(true value). The difference between the values was known as the error.
- If error was too big, the model architecture was changed to try get more accurate model results.
- After multiple iterations of this process, the model that produced the least error was selected for further analysis. .



Results

The Neural Network models used for this research project were **Long Short Term Memory (LSTM) model** and **Graded Recurrent Unit(GRU)** models**.** The figure below is a result of the models forecasting traffic volumes. The models outputs are shown with the actual traffic volumes recorded by vehicle detection devices.



From analysis the GRU model was able to forecast values better than the LSTM model.

Conclusions and Recommendations

From figure above it is clear that a Neural Network model is capable of forecasting traffic count data. This research can be used as a point of reference for future ML within the transportation field. With accurate traffic predictions better traffic planning can be done resulting in better traffic systems being designed to better suit the population.

To improve the research process, the following recommendations are given:

- Increase the number of vehicle detection devices
- Increase the frequency with which they record values.
- Improve the vehicle detection capabilities of the devices that record traffic.
- Use different models to gauge how they will perform with the given data.