METHODOLOGY

Architecture and explanation:

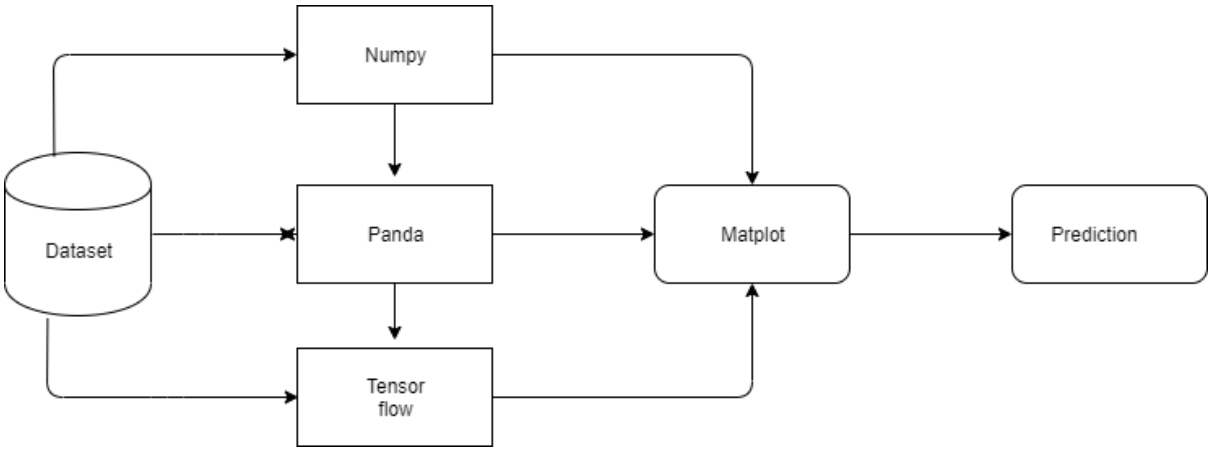

Figure 1.1: Architecture diagram

The traffic volume is our dataset. Artificial neural network will be implemented through tensor flow using RNN. The Matplot will be used to generate visual predictions with respect to time series as shown in figure 1.1.

This section presents an empirical data based framework in modeling time series hybrid model prediction.

The process is summarized as follows.

Step 1. Construct three time series according to the characteristics of historical data.

Step 2. Develop the weekly, daily, and hourly models for their corresponding time series after correlation and analysis.

Step 3. Calibrate the time dependent transition probability matrix based on models' performance using historical data.

The first step sets up three time series based on different dependencies between historical data (week, day, and hourly) and extract meaningful statistics characteristics of the data. The second step develops corresponding parametric models to capture the characteristics and output prediction series. The remainder of this section describes more details related to the above steps.

Process flow and explanation:

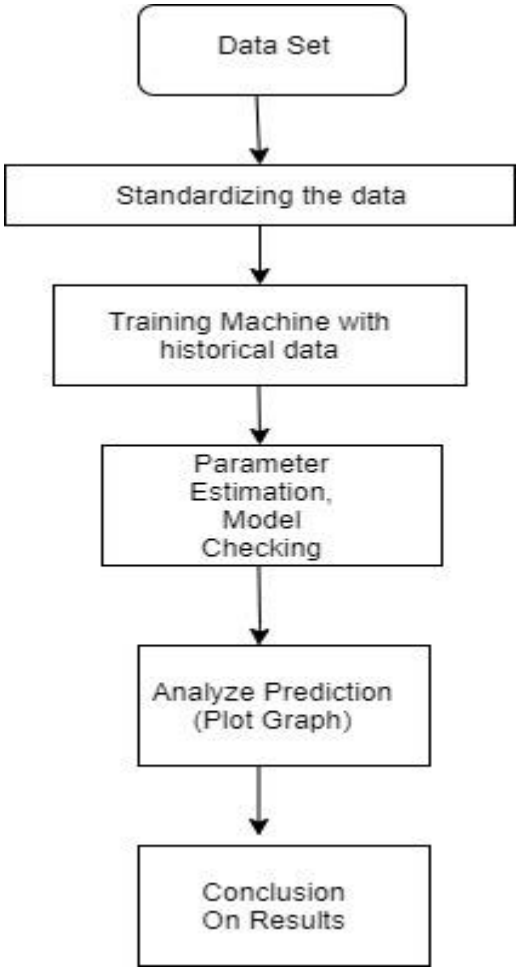

Figure 1.2: Process flow diagram

The dataset is collected from NHAI (National Highway Authorities, India) and then standardized as per our requirements. Then, the system will be trained with a set of historical data and parameter estimation is done using parametric model. The results or predictions thus obtained are analysed and predictions will be done with error correction (if required) as shown in figure 1.2.

Objective wise methodology:

i. The count of vehicles moving at a point per unit time which comprises of a set of distinct variables over time is predicted. This is done using parametric technique.

ii. Day to day forecast, maximum traffic during a particular hour of day will be predicted using time series methodology

The models used in deep learning are Feed Forward Neural Network (FFNN), Stacked Auto encoder(SAE), and Recurrent Neural Network (RNN).

Feed Forward Neural Network

It is a simple architecture with one hidden layer and the sigmoid activation function.

Stacked Sparse Autoencoder

For training the model the separate stacked Autoencoder (AE) layers are trained in a semi unsupervised fashion to recreate the features. This is done in a greedy layer-wise fashion. Then the prediction layer is trained in a supervised fashion. The prediction layer is a fully connected layer with the sigmoid activation function.

Deep Neural Network

The Deep Neural Network (DNN) model is an extension to the FFNN model. While having more than one hidden layer, it sets itself apart from FFNN by using Rectified Linear Unit (ReLU) as activation function and dropout between every layer.

Recurrent Neural Networks

RNNs will be applied to prediction tasks on sequential data. Given that traffic data also has the characteristics of being sequences where each step is dependent on the last, a Long Short-Term Memory (LSTM) model is included in the set of deep learning models.