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TRAFFIC PREDICTION USING MACHINE LEARNING

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ABSTRACT

Traffic control in large cities is extremely tough. This study deals with traffic prediction that can be done in intelligent transportation systems which involve the prediction between previous year's data set and recent year data which ultimately provides the accuracy and mean square error. This prediction will be helpful for the people who are in need to check the immediate traffic state. The traffic data is predicated on a basis of 1 hour time gap. Live statistics of the traffic is analyzed from this prediction. So this will be easier to analyze when the user is on driving too. The system compares the data of all roads and determines the most populated roads of the city.

1. INTRODUCTION

Machine Learning (ML) is one of the most important and popular emerging branches these days as it are a part of Artificial Intelligence (AI). In recent times, machine learning becomes an essential and upcoming research area for transportation engineering, especially in traffic prediction. Traffic congestion affects the country's economy directly or indirectly by its means. Traffic congestion also takes people's valuable time, cost of fuel every single day. As traffic congestion is a major problem for all classes in society, there has to be a small-scale traffic prediction for the people's sake of living their lives without frustration or tension. For ensuring the country's economic growth, the road user's ease is required in the first place. This is possible only when the traffic flow is smooth. To deal with this, Traffic prediction is needed so that we can estimate or predict the future traffic to some extent.

In addition to the country's economy, pollution can also be reduced. The government is also investing in the intelligent transportation system (ITS) to solve these issues. The plot of this research paper is to find different machine learning algorithms and speculating the models by utilizing python3. The goal of traffic flow prediction is to predict the traffic to the users as soon as possible. Nowadays the traffic becomes really hectic and this cannot be determined by the people when they are on roads. So, this research can be helpful to predict traffic.

2. LITERATURE REVIEW

In the traffic prediction using ML in ITS, with a particular emphasis on how ML increases perception, prediction, and management duties, among other things is addressed. Introduction to the ML methodologies, including terminology.

ITS

The application of communication, information, transportation, and urban transport systems is commonly referred to as ITS. Traffic safety and efficiency are two main goals of ITS. Advantages of an ITS are a) Reduced intersection stalls and delays, b) Control and enhancement of speed, c) Enhancement of travel time, d) Management of capacity, and e) Management of incidents. In recent years, ITS has been receiving a lot of attention from academic and practitioner groups. Figures 1 and 2 show a future ITS and various tasks performed coming under an ITS.

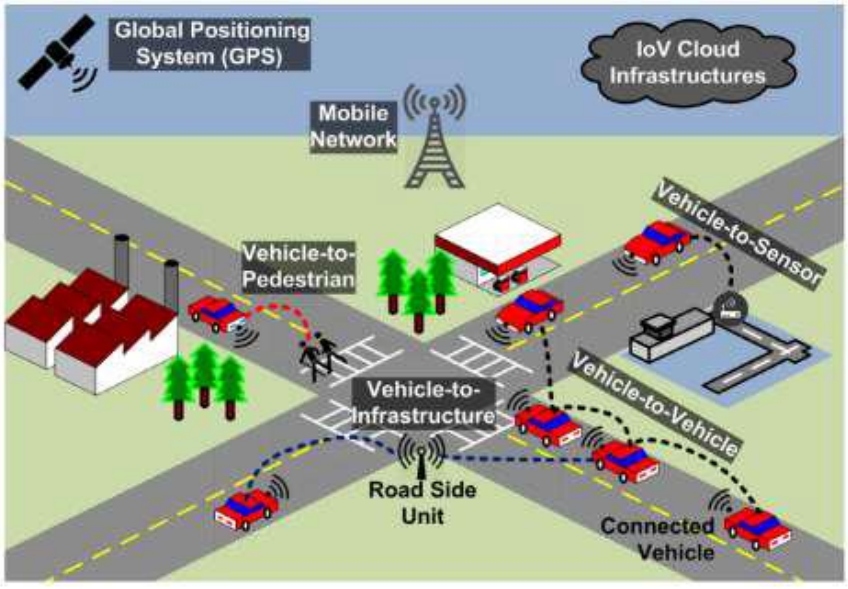

Fig.1: Future Intelligent Transportation system overview.

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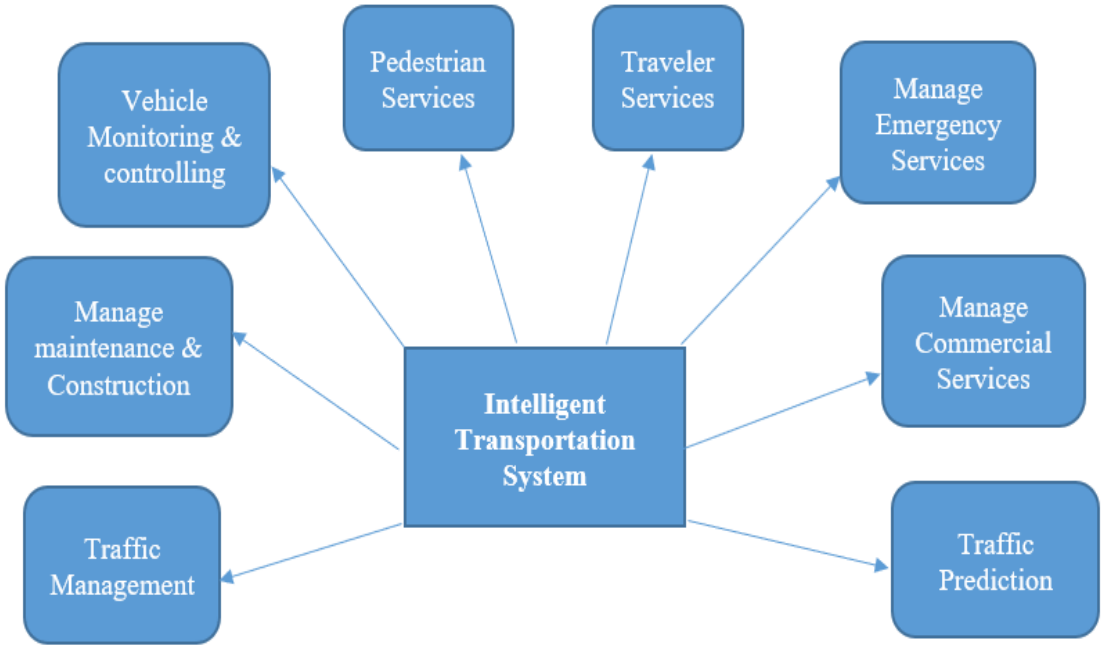

Fig. 2: Various tasks performed by an Intelligent Transportation Systems.

MACHINE LEARNING PREDICTIONS IN ITS:

ML techniques have achieved a high level of performance on prediction challenges in ITS, primarily delivering tasks that may be classified into predicting TF, travel time, vehicle behaviour, user behaviour, ad road occupancy. Table 1 shows that the various prediction category coming under traffic forecasting.

Prediction Category	Description	Role of ML
Traffic Flow	TFP using Spatio-temporal dependencies.	Learning traffic patterns may use weather data, time-series data, historical data, accident- prone area data, road maintenance work information, etc.
Travel Time	Predicting the travel time for cars, buses, bikes, and other vehicles.	Learning traffic patterns based on temporal data. Extracting features & learning travel time patterns.
The behaviour of Vehicle & User	Predicting lane changes, vehicles steering angle, pedestrian movements.	Learning & classifying driver's intentions, finding patterns from pedestrians, & future movement of vehicles.
Road Occupancy	Road density prediction for the urban region, predicting parking availability.	Modeling long or short-term predictions, learning parking occupancy patterns.

THE ROLE OF MACHINE LEARING IN TFP:

Traffic forecasting is the process of anticipating the volume and density of TF to regulate vehicle movement, decrease congestion, and produce the ideal route. Traffic forecasting is critical for two types of organizations:

a) National/Local authorities:

Many cities have embraced ITS in the last ten to twenty years to aid in the planning and administration of urban transportation networks. These systems make use of real-time traffic data ad forecasts to increase transportation efficiency and safety by notifying users about current road conditions and altering road infrastructure. Using this method, the general public can be better informed about TF and weather data on the roadways, minimizing the risk of accidents and increasing overall road safety.

b) Logistics companies:

The logistics business is another area of use. Several enterprises rely on accurate scheduling and effective route planning, including transportation, delivery, and field service. When it comes to travel, it's often not just about the present, but the future as well. For companies like these, accurate estimates of traffic and road conditions are critical to their planning and success. Figure 3 shows that the traffic congestion in an urban area.

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Fig. 3: The traffic congestion in an urban area.

Traffic jams are generated by several elements that interact in a complex way. Factors such as variations in traffic, weather data, accidents, and maintenance work all contribute to fluctuations in variations in traffic volume. Even with today's methods, environmental variables can't be predicted with any precision. To reduce congestion on the road, it is necessary to construct a more accurate prediction system. The primary goal of this study is to figure out how to accurately anticipate TF in urban road scenarios through machine learning techniques by using more of the underlying factors that contribute to traffic congestion as input into the forecasting process. Figure 4 shows a Tree representation of ML algorithms used in TFP.

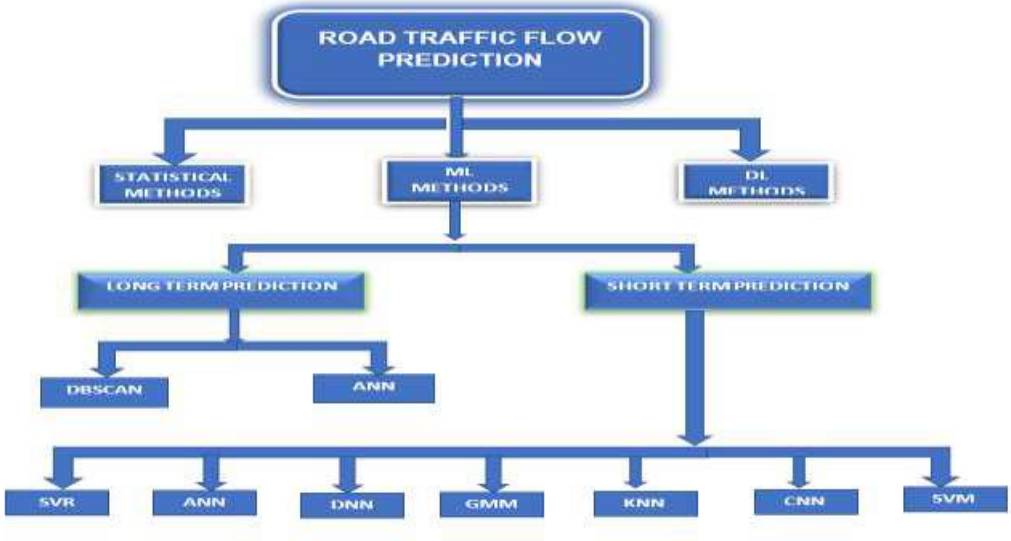

Fig. 4: ML Algorithms used in TFP.

3. METHODOLOGY

Many researchers have been used various discussed approaches. This paper contains the technique of predicting the traffic using regression model using various libraries like Pandas, Numpy, OS, Matplotlib.pyplot, Keras and Sklearn.

a) Data set

Traffic congestion is raising a lot these days. Factors like expanding urban populations, uncoordinated traffic signal timing and a lack of real-time data. The effect of the traffic congestion is very huge these days. Data collected in this paper are from the Kaggle website for the implementations of machine learning algorithms using python3 to show outputs in the traffic prediction. Two datasets are collected in which one is the 2015's traffic data which comprises of date, time, and number of vehicles, junction and the rest one is the 2017's traffic data with the same details so as to compare easily without any misconception. The unwanted data has been deleted by pre-processing the data aggregated from 1 to 24 hours time interval to calculate traffic flow prediction with each 1 hour interval.

b) Regression model

Regressor model analysis could even be a mathematical technique for resolving the connection in the middle of one dependent variable and one or more independent variables.

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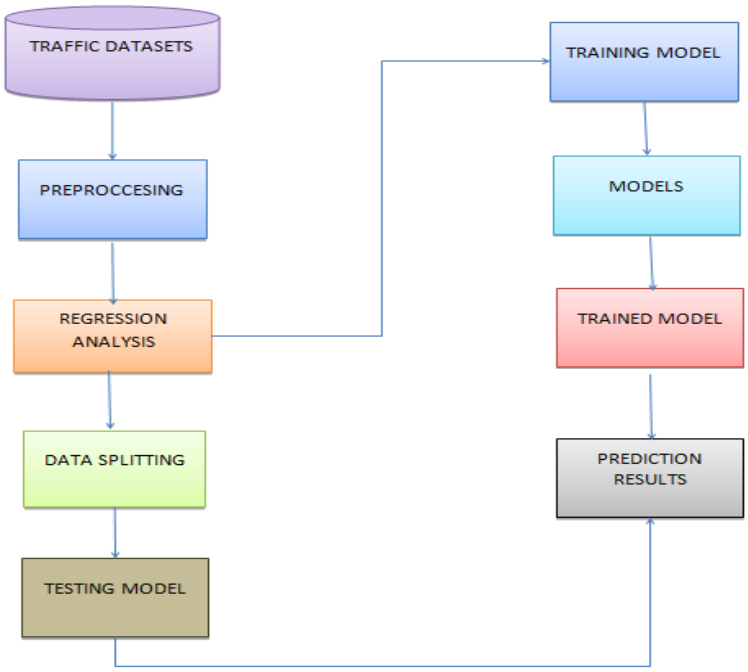

The evaluation yields a foretold value for the benchmark resulting from a sum of scalar vectors of the predictors. The accuracy is measured by computing mean square error. Thus obtaining the expected error from the observed value and also truth value which is equivalent to the standard deviation deployed within the statistical methods.

4. CONCLUSION

In this study, there is great progress and application activity in the field of TFP. Predicting and forecasting TF from both spatial and temporal data is drawing much attention these days. Predictions are made using both parametric and nonparametric approaches. ML and ANN are reported to be the quickest and accurate ways of predicting TF.

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