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MACHINE LEARNING AIDED ROAD TRAFFIC FLOW PREDICTION

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Abstract: The Intelligent Transportation System is part of several smart city applications where it improves the processes of transportation and commutation. Its aims to organize traffic problems, mainly traffic jams. The road traffic flow prediction system has wide application in the city transportation and area management. In Some cities, it is very hardest task to manage traffic. But the prediction with reflection of some physical conditions of environment and weather like raining, thunder is found more effective. we Proposed a Road traffic flow prediction system model to predict the Road traffic flow with a duration interval of one hour up to 24 hours. The algorithms are used for research in the past, but there are not so many platforms found on which road traffic flow prediction has easy to use and access to public users. The system is Proposed to organize the problems Related with the historical and time series. Historical road Traffic data set was collected from an open source and various operations perform on it as per requirements. By using Machine learning algorithms, a system is designed, which gather the data from the roads using Vehicle detection sensors and stores into the database for future predictions. We also gathered the data of weather systems to get weather data. This road Traffic flow prediction system is developed to use the existing popular ML prediction algorithms that Support Vector Machine (SVM). After experiments, results were differentiated with the actual data to check the correctness of the algorithms. Support Vector Machine (SVM) helps to predict in short term road traffic flow prediction. But a shorter time interval Provides more accurate results.

Keywords: Traffic Prediction, Support vector machines, artificial neural network, Prediction, Jams

INTRODUCTION

Traffic flow forecasting has been discussed many times with different machine learning approaches. In this paper, we did a review of different researchers and the methodologies which have been used for prediction. Different algorithms show the different results on the given data sets. Those data sets have collected from different sources. To get accurate information about current and future traffic flow there are many applications such as vehicle navigation devices, congestion management, vehicle routing, and much more application have been introduced to guide the public on the road but the problem is to get real-time data on the spot and helps the users to plan their routs according to the situations on the road but the main problem to get information about traffic flow which are not well equipped with traffic sensors and many other factors that effect to get data such as accidents, public events, and bad weather conditions. Generally, there are two ways of traffic flow prediction, such as Short Term and Long Term Traffic Flow Prediction probably long term algorithms maybe cannot provide accurate prediction results because this mechanisms predict on hourly basis such as 12 hours or 24 hours data results, as well as short term mechanisms, gives more good results because they give results in terms of minutes such as a 5 to 15 minutes or 30 to 50 minutes so in this way, the short term time interval can give more accurate prediction values. so, our model has been trained within a maximum time interval of 1 hour to give prediction results. To train this prediction model, we have gone through many researchers' contributions in this machine learning area, which have discussed in the literature review section. To meet all these problems, many researchers make a lot of effort by using different machine learning algorithms to predict traffic.

PROPOSED SYSTEM

We propose Machine Learning aided Traffic flow prediction that will help people find the shortest way to streamline their journey. We are considering more factors like weather conditions, accident area, shortest route.

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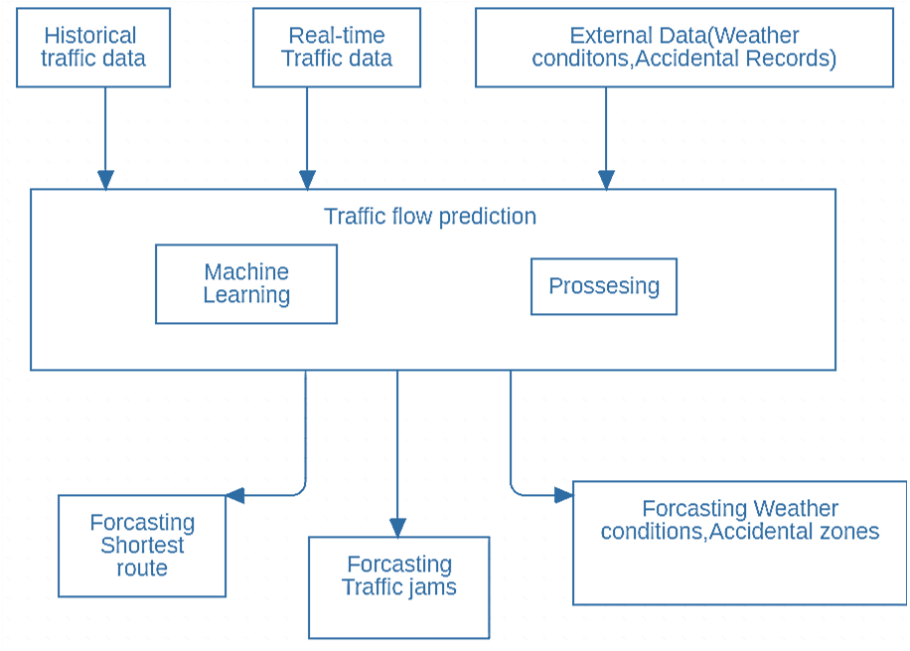
Page Layout



- Datasets (historical data, Real time traffic data, External Data) allow you to identify traffic patterns at a different scale: during the day, on different days of the week, seasonal, etc. They are usually easier, faster, and cheaper to implement than machine learning ones. However, they are less accurate since they can't process as much multivariate data.

- Machine learning (ML) allows you to create predictive models that consider large masses of heterogeneous data from different sources. Numerous studies have been conducted on the application of ML algorithms to forecast road traffic. Here are some successful examples.
- Support vector machine: The support vector machine has many methods and formulas which can be used to predict traffic data for the future. Traffic flow prediction is a nonlinear problem; it can be realized by using a support vector machine. And SVM works with the kernel functions to optimize the prediction result. Because kernel function may help SVM to transform the data. SVM is a supervised machine learning method, so it needs training data for this. It can work on any number of dimensions. When we input nonlinear data as a training sample so, with the help of this function, it can be transferred to high dimensions.
- Artificial Neural Network: These models help for traffic flow prediction with the time interval of one hour of the day. ANN split the whole data of vehicles into two data sets. The first one is the train data set, and the second is the test data. Train the data set used to train the ANN model. For the example of the existing data set, get 10000 number of vehicles and 20% data occupied by a train set and test data set to have 80% data. The data set has been modified into a time-date format, so in this way, monthly weekly information has been omitted by time format, and weekly data has changed into days of the week from 1 to 7 days of the week. ANN model works in these three layers, namely the input layer, a hidden layer, and output layer when Ann has trained for one-hour prediction it takes three parameters for input layer such as days, hours, last known several vehicles. After processing of training data and test with ANN, we got a coefficient varied from 0.85 to 0.76 for test data and 0.99 for training data. To predict data set with the three layers of the model. But the ANN algorithm has also trained with python on the collected data to give illustration graphically for traffic flow prediction with a time interval of one hour. In this way, a user may check traffic flow prediction by using the system.

OBJECTIVES

- The objective of traffic flow prediction is to provide traffic flow information.
- Predict accurate prediction about traffic flow.
- Reduce Road traffic Congestion.
- Our system can able to provide weather condition and accidental zones on roads.

Problem Statement

To solve the problems related to historical Traffic flow models we need to develop traffic flow prediction models using machine learning methods such as Support vector Machine and Artificial Neural Networks, using these algorithms, we

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have developed a prediction system by which people/users can interact with the system and collect information about current traffic situation. As well as user can able to check traffic flow for 1 to 24 hours a day with a 1-hour data interval, the system displays approximate data for 1 to 24 hours. In this way people / users can know the effect of weather and road conditions, how much traffic will be on which road in the next 24 hours, how many vehicle accidents have been recorded and on which route accidents are likely to occur. So our system can help people/user to choose the best and safest way to make their journey easier.

RELATED WORK

Many works has been done in traffic flow prediction with different algorithms and technologies. There are many algorithms thus have discussed in paper with the related work of ML techniques. Machine learning (ML) allows you to create predictive models that consider large masses of heterogeneous data from different sources. Numerous studies have been conducted on the application of ML algorithms to forecast road traffic. Here are some successful examples.

- Support Vector Machines: SVM, is a supervised learning method used for classification and regression, it is recently proved to be a promising algorithm for both data classification and pattern identification. [4–6]. SVM is very resistant to over-fitting problems, it achieves the highest generalization performance for solving various time series predictions, which has been implemented in time series predictions [7, 8].
- ANN in traffic flow prediction: Due to the random and nonlinear characteristics of traffic flow, it's troublesome to beat the limitations of constant models. Statistic machine learning ways became gradually standard non-constant approach is that the most illustrious and presently employed in the analysis. Artificial neural networks (NN) are normally utilized for this downside, which may be regarded as the overall pattern of a machine learning system in traffic engineering. Smith and Demetsky developed a NN model that was compared with ancient prediction ways and their results counsel that the NN outperforms alternative models throughout peak conditions. Dougherty et al. studied the back-propagation neural network (BPNN) for the prediction of traffic flow, speed, and occupancy, and also the results show some promise. Since then, NN approaches have normally been used for traffic flow prognostication. Additionally, several hybrid NN models are planned to improve performance. Alternative statistic models have conjointly been studied, like - nearest neighbor (NN) models and support vector regression [1]. Felix Kunde Alexander Hartenstein et a. [2] Implement an approach of feeding device knowledge to an Artificial Neural Network (ANN), but some Researchers implement ANN with completely different spatial associate degreed temporal holdups to seek out an optimum setup for a whole town. They need to be worked on a sensor network that's distributed across a whole town and got the simplest results once they are enclosed measurements from all sensors. Together with sequence data increased the prediction solely marginally. Once work with RNNs, it shall be best for statistical analysis as a result of their support to be told short and long sequences.[3]
- Traffic congestion prediction: Another research has been organized to evaluate traffic flow by using neural networks and hybrids [9] of various techniques.[10]. for example, the research conducted by vlahogianni et al. [11], traffic patterns had been identified by grouping them and traffic flow calculated by neural networks. Machine learning algorithms can predict short term transport blockage through connected traffic on the roads. This is inspired by multiple possible systems of these approaches for progressive prediction algorithms in the combined situation.[9].on other hand studies conducts two kinds of prediction models : (a) models that are not online are measured on historical information can be trained when important changes appear in the system as like changes and updating the whole framework, (b) online models measured by historical data and update the system by using usual transport condition achieved through v2v/v21 communication.[9].

METHODOLOGIES

To solve the problems related to historical Traffic flow models Many methods have been considered much time, but we use two existing methods in this paper for traffic flow prediction. The first one is a support vector machine (SVM), and the second is the artificial neural network (ANN).

A. Data set: Data collected in this paper are from the PEMS site for the implementations of machine learning methods to show outputs in this prediction system. Data collected from different numbers of VDS of the road. The data set have the number of vehicles passes from the road sensors as well as can also have types of vehicles after extracting the data from VDS and road sensors the unwanted data has been deleted by pre-processing the data aggregated from 1 to 24hours' time interval to calculate traffic flow prediction.

B. Support vector machine: SVM, is a supervised learning method used for classification and regression, it is recently proved to be a promising algorithm for both data classification and pattern identification. [4–6]. SVM is very resistant to over-fitting problems, it achieves the highest generalization performance for solving various time series

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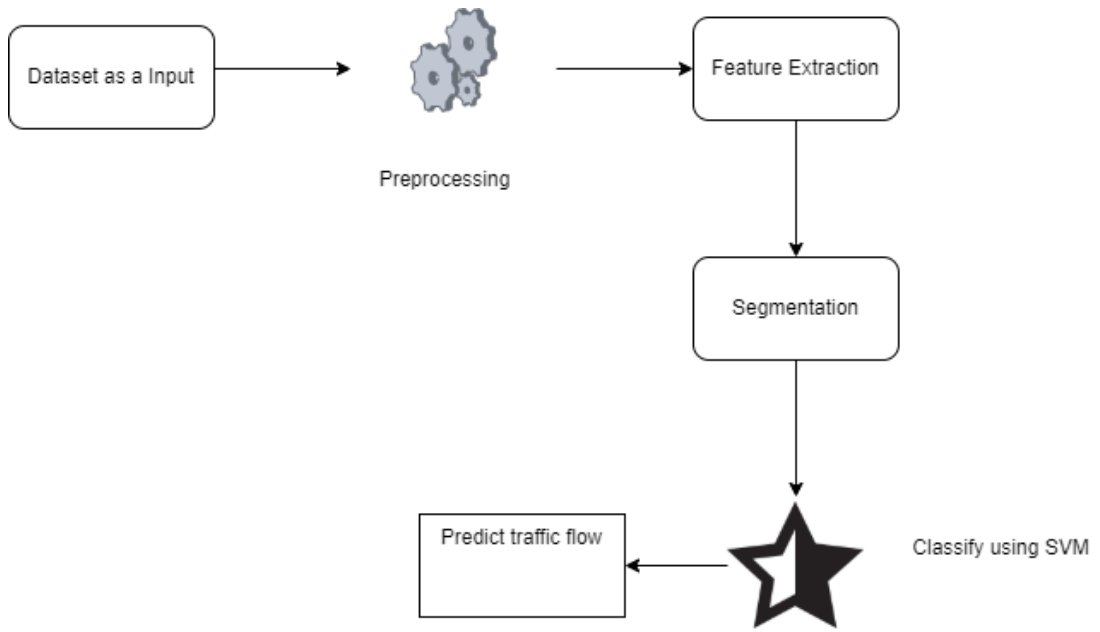
predictions, which has been implemented in time series predictions [7, 8]. The support vector machine has many methods and formulas which can be used to predict traffic data for the future. Traffic flow prediction is a nonlinear problem; it can be realized by using a support vector machine. And SVM works with the kernel functions to optimize the prediction result. Because kernel function may help SVM to transform the data. SVM is a supervised machine learning method, so it needs training data for this. It can work on any number of dimensions. When we input nonlinear data as a training sample so, with the help of this function, it can be transferred to high dimensions.

SVM algorithm based on statistical learning theory, which can be adjusted to complex input-output for nonlinear systems without depending on specific functions. Unlike other nonlinear optimization methods, SVM's solution can achieve the world optimal solution without local minimum point limits and it shows strong resistance to over-fitting problem and high normalization performance.

C. Artificial Neural Network: These models help for traffic flow prediction with the time interval of one hour of the day. ANN split the whole data of vehicles into two data sets. The first one is the train data set, and the second is the test data. Train the data set used to train the ANN model. For the example of the existing data set, get 10000 number of vehicles and 20% data occupied by a train set and test data set to have 80% data. The data set has been modified into a time-date format, so in this way, monthly weekly information has been omitted by time format, and weekly data has changed into days of the week from 1 to 7 days of the week. ANN model works in these three layers, namely the input layer, a hidden layer, and output layer when Ann has trained for one-hour prediction it takes three parameters for input layer such as days, hours, last known several vehicles. After processing of training data and test with ANN, we got a coefficient varied from 0.85 to 0.76 for test data and 0.99 for training data. To predict data set with the three layers of the model. But the ANN algorithm has also trained with python on the collected data to give illustration graphically for traffic flow prediction with a time interval of one hour. In this way, a user may check traffic flow prediction by using the system.

SYSTEM ARCHITECTURE



ADVANTAGES

- Traffic flow is predicted hourly up to 24 hours.
- Travel route is predicted by using weather conditions.
- Accidental zones are also considered while prediction.
- Traffic speed can be control by using this model.

CONCLUSION

In the system, it has been concluded that we develop the traffic flow prediction system by using a traffic flow prediction algorithm. By using two existing prediction algorithms, those are ANN and SVM. We try to utilize these models for our system to give the best prediction result on the developed system. The public can take many benefits by using this system because the users can know what the situation of traffic flow on the current situation is and they can also check what will

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be the flow of traffic on the right after one hour of the situation. This system also helps to check the weather conditions of the roads. As well user may also check about accident record that how many accidents occurred on which road so which would be safe for a future drive. In future, we can improve this system by making traffic congestion prediction, and many more factors that affect the management, as well as the flow of traffic, can be considered by using many other deep learning methods, as well as user, can use the system to find which route would be easiest to reach on destination. The system can suggest to the user according to their search.

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