Traffic Flow Prediction Using Machine Learning

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Abstract: We created a prediction system employing machine learning methodologies such as SVM to solve the challenges associated with historical and time series data. Through these users can have interaction with the system and collect the information about current situation of traffic as well as also can check the traffic flow from the 1 to the upcoming next 24 hours of a complete day with a given time interval of 1-hour data. Deep neural networks, a distributed random forest, a gradient boosting machine, and a generalized linear model were all examined as predictive methods for traffic flow prediction. Proactive traffic management is a subset of smart mobility applications in which traffic control tactics are established ahead of time to respond to expected road conditions. Proactive traffic control systems, such as proactive freeway ramp management, proactive variable speed limits, and proactive incident management systems, use predicted traffic flows as a significant input.

I. INTRODUCTION

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 be the flow of traffic on the right after one hour of the situation.

Although traffic flow prediction based on deep learning models performs better in general, deep learning model training and updating incur significant time and computational overhead, making it challenging to meet the real-time need for short-term traffic flow prediction.

To relieve traffic congestion and achieve intelligent traffic control and management, short-term traffic flow prediction is more realistic and important. As a result, the model update speed must be quick enough to meet the high real-time performance requirement of short-term traffic flow forecast while maintaining high accuracy.
II. LITERATURE SURVEY


In this research paper as a case study, we predict the flows of a traffic network in San Francisco, CA, USA, using a macroscopic traffic flow simulator. Monte Carlo simulations were found to be the most optimal for the approach. The simulations performed were effective in proving the accuracy of the generated approach.

[2] “Traffic Flow Forecasting at Micro-locations in Urban Networks using Bluetooth Detector” by Dominik Cvetek; Mario Muštra; Niko Jelušić; Borna Abramović

In this research paper, it was showed that ARIMA model gives the best performance in forecasting a traffic demand. This data-driven method can assist drivers make better routing decisions and serve as a reference for traffic planning strategy.


In this research paper, the case study showed that the inclusion of traffic flow, speed, occupancy, and time of day in the traffic prediction process reduces the traffic prediction error.


In this research paper Video detecting technology belongs to non-contact detecting technology, also known as image processing or artificial vision. This technology combines video images with computerized identification was studies.


This research paper is based on freeway, introducing the mechanism and characteristics of some advanced dynamical traffic flow information collection technology and analyzing traffic flow speed characteristic by researching and hence obtaining useful data on freeway traffic flow, which provides a solid basis for study of speed control of vehicle.

[6] “METANET Validation of the Large-Scale Manchester Ring-Road Network Using Gradient-Based and Particle Swarm Optimization” by Adam Poole and Apostolos Kotsialos

The challenge of macroscopic traffic flow model validation for ring-road shaped large-scale highway networks is addressed in this research.


In this research paper, Monte Carlo simulations were used to evaluate our methodology. Our simulations show that the proposed method is accurate. The traffic flow prediction errors vary from an average of 230-min windows even in the presence of unpredictable events.

In this research paper, it was demonstrated that the ARIMA model performs well in anticipating traffic demand. This data-driven strategy can assist drivers in making better routing decisions and also serve as a guide for strategic traffic planning.


In this research paper collected data was used to compare a few common time series methods: Random walk, Exponential smoothing, ARIMA, SARIMA, and Unobserved components. Our goal was to evaluate traffic data collected by a BT(Bluetooth) detector at a micro-location using time series forecasting methods.


This research paper is based on freeway mechanism which introduces the characteristics of advanced dynamic traffic flow data and the technology used to collect it effectively.

III. PROPOSED SYSTEM APPROACH

The system which is created is used for prediction of traffic for a given dataset of CSV (comma separated values) format. Users will get predicted traffic using the support vector machine (SVM) Algorithm of machine learning. The route is shown as normal or heavy based on the prediction algorithm. Users can as well also can check the traffic flow from 1 to next 24 hours of a day with the time interval of 1-hour data.

![System Architecture Diagram]

**Support Vector Machine (SVM):**

Input: Text dataset (CSV) input – source and destination points

Output: Predicting the route as normal or heavy based on SVM (Support vector machine) Algorithm. Also, users can find the predicted traffic flow form 1 to next 24 hours with interval of 1-hour data.
IV. ALGORITHM

The Support Vector Machine (SVM) Algorithm of machine learning is used for solving classification problems and regression problems. As a result, the SVM method assists in the discovery of the best line or decision boundary, which is referred to as a hyperplane. The SVM method identifies the point at where the lines from both classes cross. These points are widely known as support vectors. Margin is also known the distance between the vectors and the hyperplane. The purpose of SVM is to increase maximally the margin as much as it is possible. Where the largest margin is found is successfully marked as the most optimal hyperplane. We created a

V. FUTURE SCOPE/WORK

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.

Fig.: Output – Traffic Predicted As Heavy

Fig.: Output – Traffic Predicted As Normal
VI. CONCLUSION

We propose a new communication pattern-based method for detecting traffic anomaly in a network modeled as TDGs over time, which enables us to detect changes in a network traffic structure. The DK-2 distance metric was an optimal choice in predicting mistakes and shortcomings. We analyzed the 1999 DARPA Intrusion Detection dataset to evaluate our approach, and also traffic at POSTECH during July 2009. The dataset includes actual mistakes and missing values which made it vulnerable. In terms of accuracy, our approach detected anomalies in the POSTECH trace with 100 anomaly detection in the POSTECH campus network.

REFERENCES


