Application of Machine Learning in Traffic Prediction: New Techniques

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Abstract - Machine learning consist of different set of algorithms and different statistical method models. And these are used by the help of computers to perform the required task. Some of the application of machine learning are face detection, speech recognition, medical diagnosis, traffic prediction etc.

If we take the past few years, we can see that GPS navigation become quite popular in many of the cities. It is helpful in determining traffic ratio using central traffic managing servers. Using the data, we can calculate the current traffic and could be used in making future traffic predictions.

This paper suggest some traffic prediction methods instead of GPS are non-parametric method, machine learning based method, neural network models, statistics based method, LoRA(long range wide area networks) and a technique which is useful for patter learning which is geotraffic predict.

Key Words: Intelligent transportation system, LoRA, Geotraffic predict

1. INTRODUCTION

We know that modern cities are developing into smart cities. The rapid growth of population causes greater impact on traffic management system. ITMS has a greater share on smart cities for predicting traffic. Traffic data are very challenging, because the data can be vary within time and space. Also it can be influenced by some external factors like whether conditions, road attributes etc… Traffic flow, speed of vehicle, demand of time, occupany of the road, travel time are some of the main features affecting traffic prediction.

2. REVIEW

In the past few years, almost every smart cities have been suffering from traffic issues. People are wasting a lot of time due to traffic.

For solving this issue, this paper target at different traffic prediction methods.

In this 21st century, we need an intelligent transportation system (ITS) which is helpful for solving the transportation related problems. The traffic prediction is more involved in having demand for intelligent transportation system. Through road routing, shortest path computing, traffic congestion control etc. traffic prediction supports intelligent transportation system.

Mainly, statistics based and machine learning based methods are focused in intelligent transportation system. Statistics based is more efficient, but the adaptability of this method is less rather than the machine learning based method.

There are different prediction methods in traffic prediction; they are mathematical modelling methods, parametric methods and non-parametric method. Non-parametric is the most famous among these methods. The machine learning based method comes under this non-parametric method which is more effective than the parametric method. The advantage of machine learning based (ML) method is that, we doesn't need the knowledge about the pattern in traffic prediction. ML method is subdivided into regression model, example based model and kernel based model. One of the main reason for traffic will be population. As the population increases, the traffic flow will be hard to solve. It is very difficult to predict the decision from the web traffic flow pattern and the number of populations. As we know, the machine learning method is promoted because we don't need the pattern knowledge in traffic prediction.

A solution to learn about the Spatio-temporal pattern of traffic flow, a new innovation known as Geotraffic predict has been proposed. To promote the accurate Spatio-temporal prediction of web traffic flow, the geotraffic predict is more helpful. With the help of spatio-temporal domain knowledge, we can make accurate traffic prediction using the neural network models.

LoRA (Long range wide area network) is another technique developed by Cyclo of Grenoble, France and acquired by semtech in 2012. Dynamic traffic flow and static traffic signal is major problem which result in traffic. Driving is one of the most hectic target of the day. All drivers experience tiredness and frustration whenever they are engaged in a long traffic.

Technique called ITMS (intelligent traffic management system) is designed for this wireless network LoRA. ITMS controls traffic flow through LoRA assigning parking for vehicles, services in medical field and city protection. It is necessary to collect data, that's why ITMS and LoRA cloud platform are related. Then the data is passed through algorithm of machine learning that we can predict the road is congested.

Implementing a comparison of neural network, vector network, random forests and multiple linear regression was used for predicting traffic statuses of Thessaloniki. These data were collected on the basis of stationary and floating traffic of a city.

Knowledge graph is an essential tool for integrating knowledge. It contains complex relational network of large concepts, entities, relations and attributes. Domain knowledge about transportation is hidden in multi-sources and massive big traffic data. These knowledge graph helps to dig deeper traffic information and improve the efficiency of prediction.

Another efficient method for predicting the traffic is the emergent intelligence (EI) technique which is adaptable to condition of road, when speed of computing is low and the processing time is more. This technique will help to decrease the adequate use of vehicle, Fuel and space for parking.

Traffic will dynamically change so that EI (emergent intelligent) is an efficient choice for this reason.

The EL technique used for collection and analysis. This technique form a group which consist of staff from transportation system, units of roadside, peoples and vehicles and then collect the resources, analyse and refine the data to decide to analyse, predict and manages the traffic flow. That can be done by dividing a metropolitan area into regions and they subdivide to zone and then to space, time.

If we contain a very large number of data regarding traffic, we can use non-parametric model where the algorithm make the study from the data in the dataset and select the best from them. KNN is easy to implement non-parametic model. Non-parametic prediction can also be implemented in artificial neural network where they imitate the working of human brain. But it also contains certain drawbacks.

The main aim and limitation of having good traffic prediction is the availability of historical data. This can be rectified by using social media where twitter is proposed as a data centre for traffic prediction. For training the model, the tweet information is used.

3. CONCLUSIONS

Here we consider the existing traffic prediction methods and give a taxonomy about them. Also we investigate the performance in it.

This made more easier for the one to get a quick idea about traffic prediction system, so they can find the branches which they are interested. All the basic methods like LoRA, ITMS, machine learning based method, neural based model, geotraffic predict, statistics based methods are major and new keys for efficient solving , high performance. Not only this, if it is more efficiently, we can provide better experience for vehicle parking, criminal tracking etc.

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