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Traffic Prediction for Intelligent Transportation Systems Using Machine Learning

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ABSTRACT

The goal of this project is to provide a platform for forecasting accurate and timely traffic data. Traffic conditions include things that can affect road traffic speeds, such as: B. Traffic lights, accidents, protests and even road repairs that can cause traffic jams. Motorists or drivers should make informed decisions when they have very accurate prior knowledge of all of the above approximations and more real-world conditions that may affect traffic. I can. can be lowered. It is also useful for the development of self-driving cars. Transportation data has increased dramatically over the past decades and is evolving towards the concept of transportation big data. Current traffic prediction approaches use specific traffic prediction models that are still inadequate to handle real-world situations. Therefore, we tackled the problem of traffic prediction using traffic data and models. Due to the vast amount of data available in transportation systems, it is difficult to accurately predict traffic flows. In this study, we wanted to use machine learning, genetics, soft computing, and deep learning techniques to evaluate vast amounts of data in transportation systems while greatly reducing complexity. In addition, it uses image processing algorithms to recognize traffic signs and ultimately help train self-driving cars properly.

Keywords: Traffic Environment, Deep Learning, Machine Learning, Genetic Algorithm, Big Data, Image Processing.

I. INTRODUCTION

Various economic sectors, authorities and individual passengers need accurate and relevant information about traffic flows. It helps passengers and drivers make better travel decisions to minimize traffic congestion, increase efficiency in transportation operations and reduce carbon footprint. Intelligent transportation systems (ITS) are being developed and deployed to improve the accuracy of traffic flow predictions. It is considered a key factor in the success of modern public transport systems, passenger information systems and traffic control systems. [1]. Both real-time traffic data and historical information collected from various sensor sources such as inductive loops, radar, cameras, mobile global positioning systems, crowdsourcing, and social media are required to determine traffic flow. Traffic data is growing

exponentially as we enter an era in which massive amounts of data are transmitted and both traditional sensors and innovative technologies are widely used. Data is increasingly used in transport control and governance. [2], [3]. However, many traffic prediction systems and models already exist. Most of them use a flat traffic model, but still have significant drawbacks due to the huge size of the data set.

II. LITERATURE SURVEY

Machine Learning Traffic Prediction for Intelligent Transportation Systems

Authored by Gaurav Meena, Deepanjali Sharma, and Mehul Mahrishi. IEEE PUBLICATION (2020)

IMPLICATION - ITS ensures the safe and efficient movement of vehicles on roads. Classification and regression are determined using SVM algorithms, decision trees, and random forests.

SMART TRAFFIC ANALYSIS USING MACHINE LEARNING

Authored by Adithya Krishna K.V.S., Abhishek K., Allam Swaraj, Shantala Devi Patil, and Gopala Krishna Shyam.

IJEAT PUBLICATION (2019)

INFERENCE - Analysis using the random forest algorithm to predict the mean squared error (MSE), computing the mean absolute error (MAE), which is the difference between two continuous variables X or Y, and calculating the mean squared Square root error (RMSE). It is a commonly used measure of variation in values predicted by machine learning models.

Concepts, Architecture, and Applications of Paper Control and Management for Intelligent Transportation Systems

Author - Fei Yue Wang IEEE PUBLICATION (2011)

INFERENCE - We studied the PTMS system architecture and five ATS components.

A Decentralized Approach for Predictive Vehicle Routing Using a

Multi-Agent Delegate System

Authored by Rutger Claes, Tom Holvoet, and Danny Weyns.

IEEE PUBLICATION (2011)

INFERENCE - In large-scale dynamic situations, this work provides a distributed method for predictive vehicle routing. A delegated multi-agent system is the cornerstone of the strategy.

Comparison of Semantic Indexing of Videos and Index Point Detection.

Authored by Mehul Mahrishi and Sudha Morwal.

IEEE PUBLICATION (2011)

INFERENCE - Study current techniques for automatic indexing and annotation of videos and examine results and gaps using YoloV4.

Classification and Prediction Applications of Decision Tree Algorithms.

Authored by Yan-yan Ying SONG LU

Shanghai Archives of Psychiatry, Publication (2015)

INFERENCE - Common data mining techniques to create predictive algorithms for target variables or create classification systems based on multiple variables are , which is an inference-decision tree approach.

III. IMPLEMENTATION AND RESULTS

Several machine algorithms were used and evaluated to achieve higher efficiency and more accurate results. A decision tree algorithm was used to distinguish between classification and regression (DT). The goal of this approach is to predict the value of the target variable. Decision tree learning is a function that takes a vector of attribute values as input and produces a single output result or "decision". It belongs to the subcategory of supervised learning algorithms. It can be applied to solve classification and regression problems. DT determines its results by running a series of tests on the training dataset.

Another important step in obtaining accurate results is outlier detection. To do this, we employed support vector machines (SVMs), a collection of supervised learning techniques that can also be applied to classification and regression. SVMs are useful for high-dimensional spaces and also work well when the

number of samples is less than the dimensionality. A reliable machine learning algorithm is the random forest algorithm. The term bootstrap aggregation describes it. Random forest methods are primarily used for data classification and are based on predictive models. You can generate many models from a single training dataset using the bootstrap process. The samples were also used in the bootstrap method to estimate statistics.

The congestion prediction method proposed by our company is shown below.

Algorithm 1: To identify high traffic areas

1. Collect traffic statistics every 5 minutes using:

A. One. Position (measured by GPS)

B. Velocity

C. Direction

D. Start-End Intersection

2. Assign groups to related data for each 5-minute interval.

3. Determine the distance between each vehicle and other vehicles in the specified intersection. Two cars are considered adjacent if the distance between them is less than a certain criterion. Otherwise,

is not considered an adjacent vehicle. end IF

Algorithm 2 for Classifying Crowded Environments

1. Ultimately, this leads to matrix A.

2. Now assign 1 to A[i, j] if A[i, j] is greater than the threshold, otherwise A[i, j] =0

If exit

3. Count A[. i, j]=1, identifying I j as a local car.

4. Repeat steps 1-3 every 5 minutes for 45 minutes.

5. Create a graph between the number of cars nearby and the time.

A traffic jam is detected if the number of cars in the neighborhood is increasing.

otherwise

if there is no end of traffic

Here are the implementation steps:

1) Development of programs that can provide GPS coordinates.

2) Apply the proposed algorithm.

3) Evaluate the matrix of the dataset.

4) Separate the training and testing parts of the dataset.

5) Examine some machine learning algorithms.

6) Use a machine learning system to predict parameters for 45 minute intervals.

7) What do you think about traffic jams?

By implementing techniques like the one above, we can create machine learning models that are more accurate than those currently in use. Applying the BP approach with a gradient-based improvement strategy facilitates training of deep networks. Note that deep networks designed using this approach unfortunately perform poorly. Therefore, I did not apply deep learning models to my research. The datasets created have few attributes, so it makes no sense to use deep learning and genetic algorithms. By using the proposed technique, we were able to solve some challenges with big data and limit the huge dimensionality of the dataset to prevent model overfitting.

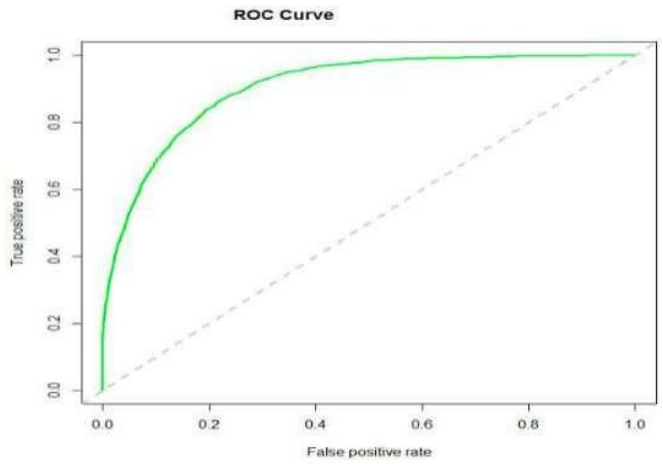
IV. RESULTS

Table 1:

It shows the performance of models built using various machine learning techniques covered in this work. The table lists various qualities such as accuracy, precision, memory, and duration.

Table 1 EVALUATION MATRIX FOR DIFFERENT MACHINE LEARNING ALGORITHMS

ALGORITHM	Accuracy	Precision	Recall	Time
DECISION TREE	88%	88.56%	82%	108.4sec
SVM	88%	87.88%	80%	94.1sec
RANDOM FOREST	91%	88.88%	82%	110.1sec



ROC Curve for Decision Tree Algorithm

For various cut-off points of a parameter, the actuality positive rate (Sensitivity) is anticipated in the performance of the false positive rate (100-Specificity). Each goal on the fabled monster curve symbolises a sensitivity/specificity attempt similar to a chosen call threshold. The area under the fabled monster curve (AUC) may be an indicator of how successfully a parameter will separate two teams.

V. Conclusion

Deep learning and genetic algorithms are important topics in data analysis, yet the ML community has not explored them in depth. The proposed approach ameliorate concerns about overall dataset complexity and provides higher accuracy than currently used algorithms. Web servers and applications are also integrated as intended. The article algorithm has also been significantly improved, resulting in much better accuracy.

VI.Conclusion And Future Work

Deep learning and genetic algorithms are important topics in data analysis, but they have received little attention from the machine learning community. The proposed solution overcomes the problem of dataset complexity and provides higher accuracy than current approaches. I also plan to combine the application with a web server. In addition, the article algorithm is further improved to greatly improve accuracy.

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