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Traffic Prediction for Intelligent Transportation System using Machine Learning

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ABSTRACT:In recent years, traffic congestion prediction has led to a growing research area, especially of machine learning of artificial intelligence (AI). With the introduction of big data by stationary sensors or probe vehicle data and the development of new AI models in the last few decades, this research area has expanded extensively. Traffic congestion prediction, especially short-term traffic congestion prediction is made by evaluating different traffic parameters. Most of the researches focus on historical data in forecasting traffic congestion. However, a few articles made real-time traffic congestion prediction. This paper systematically summarises the existing research conducted by applying the various methodologies of AI, notably different machine learning models. The paper accumulates the models under respective branches of AI, and the strength and weaknesses of the models are summarised.This paper aims to develop a tool for predicting accurate and timely traffic flow Information. Traffic Environment involves everything that can affect the traffic flowing on the road, whether it's traffic signals, accidents, rallies, even repairing of roads that can cause a jam. If we have prior information which is very near approximate about all the above and many more daily life situations which can affect traffic then, a driver or rider can make an informed decision. Also, it helps in the future of autonomous vehicles. In the current decades, traffic data have been generating exponentially, and we have moved towards the big data concepts for transportation. Available prediction methods for traffic flow use some traffic prediction models and are still unsatisfactory to handle real-world applications. This fact inspired us to work on the traffic flow forecast problem build on the traffic data and models. It is cumbersome to forecast the traffic flow accurately because the data available for the transportation system is insanely huge. In this work, we planned to use machine learning, genetic, soft computing, and deep learning algorithms to analyse the big-data for the transportation system with much-reduced complexity. Also, Image Processing algorithms are involved in traffic sign recognition, which eventually helps for the right training of autonomous vehicles.

KEYWORDS: Artificial Intelligence, Traffic Jam, Image processing, Autonomous vehicles,traffic prediction mod

I. INTRODUCTION

Artificial intelligence (AI) is the most important branch of computer science in this era of big data. AI was born 50 years ago and came a long way, making encouraging progress, especially in machine learning, data mining, computer vision, expert systems, natural language processing, robotics, and related applications [1]. Machine learning is the most popular branch of AI. Other classes of AI include probabilistic models, deep learning, artificial neural network systems, and game theory. These classes are developed and applied in a wide range of sectors. Recently, it has been the leading research area in transportation engineering, especially in traffic congestion prediction.

Traffic congestion has a direct and indirect impact on a country's economy and its dwellers' health. According to Ali et al. [2], traffic congestion causes Pak Rs. 1 million every day in terms of opportunity cost and fuel consumption due to traffic congestion. Traffic congestion affects on individual

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level as well. Time loss, especially during peak hours, mental stress, and the added pollution to the global warming are also some important factors caused due to traffic congestion.Artificial intelligence (AI) is the most important branch of computer science in this era of big data. AI was born 50 years ago and came a long way, making encouraging progress, especially in machine learning, data mining, computer vision, expert systems, natural language processing, robotics, and related applications [1]. Machine learning is the most popular branch of AI. Other classes of AI include probabilistic models, deep learning, artificial neural network systems, and game theory. These classes are developed and applied in a wide range of sectors. Recently, it has been the leading research area in transportation engineering, especially in traffic congestion prediction.

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There are a few recent surveys that have reviewed the literatures on traffic prediction in certain contexts from different perspectives. reviewed the methods and applications from 2004 to 2013, and discussed ten challenges that were significant at the time. It is more focused on considering short-term traffic prediction and the literatures involved are mainly based on the traditional methods. Another work also paid attention to short-term traffic prediction, which briefly introduced the techniques used in traffic prediction and gave some research suggestions. provided sources of traffic data acquisition, and mainly focused on traditional machine learning methods. outlined the significance and research directions of traffic prediction. and summarized relevant models based on classical methods and some early deep learning methods.

Alexander et al.[4] presented a survey of deep neural network for traffic prediction. It discussed three common deep neural architectures, including convolutional neural network, recurrent neural network, and feedforward neural network. However, some recent advancements, e.g., graph-based deep learning, were not covered in is an overview of graph-based deep learning architecture, with applications in the general traffic domain. provided a survey focusing specifically on the use of deep learning models for analyzing traffic data. However, it only investigates the traffic flow prediction. In general, different traffic prediction tasks have common characteristics, and it is beneficial to consider them jointly. Therefore, there is still a lack of broad and systematic survey on exploring traffic prediction in general.

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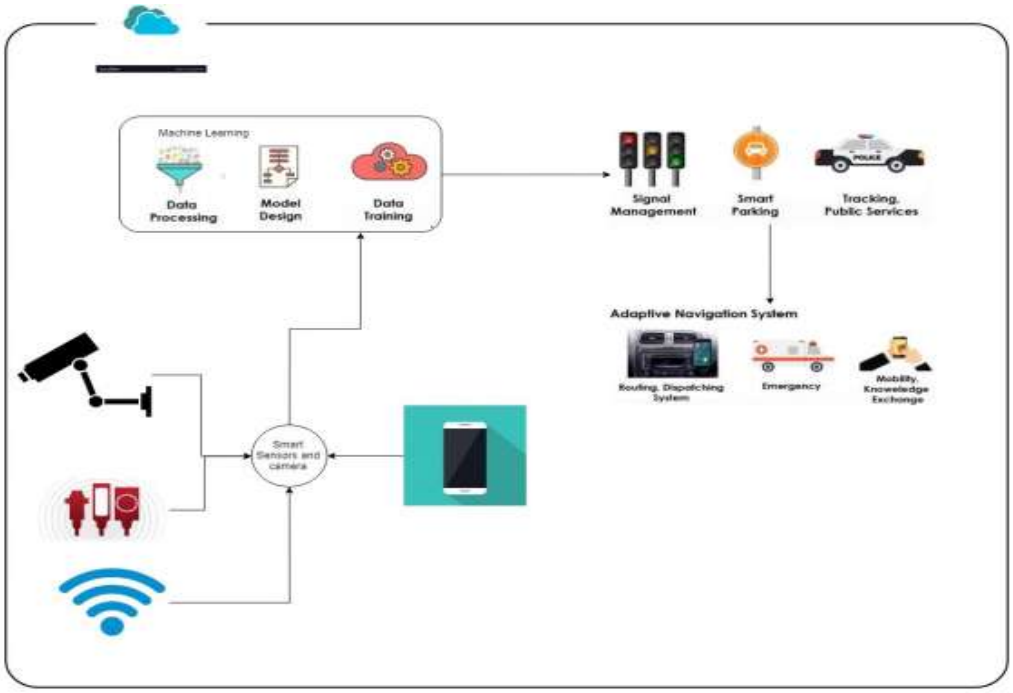

II. MATERIALS & METHODS

To detect the number of vehicles. For that we are using neural network algorithm as the basis of the design. Framework for the neural networks is must before starting to design the algorithm. We used Tensor Flow framework and Keras framework to create a neural network which will detect number of vehicles. A convolution neural network is used which is one type of neural network. The datasets will be fed into the designed neural network so to train the neural network in order to get highly accurate results.The general phases for developing intelligent transportation and control systems, these phases are:

1. Data Collection:

Traffic data are collected using different methods, such as Image- or video-based methods. Surveillance cameras are used to visually observe road traffic in a specific area and record or stream the captured images/videos to control rooms. It is widely used in the area of managing road traffic due to efficiency and ease of maintenance. However, video and image contents require lot of storage, network bandwidth, and computation complexity.

2. Data Preprocessing:

Data preprocessing mainly involves data cleaning and sparsity analysis.

Therefore data manipulation is required, some of these approaches are:

- Data cleaning, which includes noise removal, malfunction detection, recover missing data.
- Sparsity Analysis, which includes remove some redundant features from the original feature space using compressive sensing or heterogeneous learning.

3. Data Analysis:

Data analysis includes using different analysis tools to provide useful information such as estimation of the total number of vehicles using a specific segment of roadway at any given day of the year. These approaches are generally based on machine learning, data mining, and artificial intelligence algorithms.

4. Machine learning application on data(KNN)

K nearest neighbors is an easy algorithm that stocks all existing cases and predict the numerical target based on a similarity measure (e.g., distance functions). KNN has been utilized in statistical estimation and pattern recognition already in the beginning of 1970's as a non-parametric technique. It is also called a lazy learner algorithm because it does not learn from the training set instantly instead it stores the dataset and at the time of classification, it performs an action on the dataset. KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much suitable to the new data. It is easy and simple to

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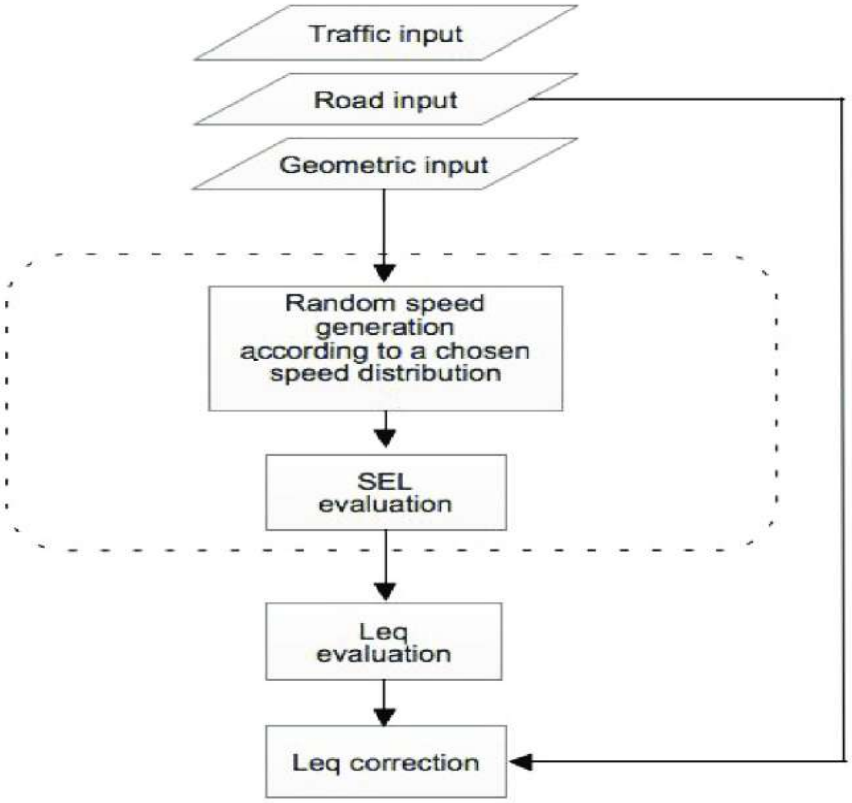
perform. It can be done using programming languages such as R or python.



III. CONCLUSION

Although deep learning and genetic algorithm is an important problem in data analysis, it has not been dealt with extensively by the ML community. The proposed algorithm gives higher accuracy than the existing algorithms also, It improves the complexity issues throughout the dataset. Also we have planned to integrate the web server and the application. Also the things algorithms will be further improved to much more higher accuracy. Traffic congestion prediction is getting more attention from the last few decades. With the development of infrastructure, every country is facing traffic congestion problem. Therefore, forecasting the congestion can allow authorities to make plans and take necessary actions to avoid it. The development of artificial intelligence and the availability of big data have led researchers to apply different models in this field. This article divided the methodologies in three classed. Although probabilistic models are simple in general, they become complex while different factors that affect traffic congestion, e.g., weather, social media, and event, are considered. Machine learning, especially deep learning, has the benefit in this case. Therefore, deep learning algorithms became more popular with time as they can assess a large dataset. However, a wide range of machine learning algorithms are yet to be applied. Therefore, a vast opportunity of research in the field of traffic congestion prediction still prevails.

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