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MACHINE LEARNING BASED TRAFFIC PREDICTION FOR INTELLIGENT TRANSPORTATION SYSTEMS

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ABSTRACT:

This paper aims to provide a tool for accurate and timely traffic flow data predictions. Everything that could affect how much traffic is moving along a road is referred to as the "traffic environment," including traffic lights, collisions, demonstrations, and even road works that might cause a delay. If a driver or rider has prior knowledge that is near to accurate about all the aforementioned factors and many more actual situations that might affect traffic, they can make an informed decision. Additionally, it promotes the development of autonomous vehicles. Recent decades have seen a significant increase in traffic data, and big data concepts for transportation are becoming more prevalent.Although several traffic prediction models are used in the current methods for estimating traffic flow, they are still insufficient to deal with real-world scenarios. As a result of this, we started using the traffic data and models to work on the traffic flow forecast problem. It is impossible to accurately predict the traffic flow since the transportation system has access to an insane quantity of data. With the use of machine learning, genetic, soft computing, and deep learning approaches, we aimed to considerably reduce the complexity of the analysis of large data for the transportation system in this work. Additionally, traffic signs are recognised using image processing techniques, which eventually help with the correct training of autonomous vehicles.

Keywords: Traffic Environment, Deep Learning, Machine Learning, Genetic Algorithms, Soft Computing, Big Data, Image Processing

[1] INTRODUCTION

Accurate information on traffic flow is required by a variety of commercial sectors, governmental agencies, and individual travellers. It helps drivers and passengers make wiser travel choices in order to reduce traffic congestion, improve traffic operation efficiency, and reduce carbon emissions. The development and implementation of Intelligent Transportation Systems (ITSs) increases the precision of estimates of traffic flow. It is crucial to the success of modern public transportation systems, traveller information systems, and traffic management systems. The flow of traffic must be determined using both real-time data and historical data from a range of sensor sources, including as inductive loops, radars, cameras, mobile Global Positioning Systems, crowdsourcing, and social media.As a consequence of the widespread use of both traditional sensors and cutting-edge technology, which is resulting in an explosion of traffic data, we have entered the era of enormous data transportation. Data is being used in transportation management and control more and more. However, a number of systems and models for predicting traffic flow already exist; the bulk of them rely on superficial traffic models and continue to have serious drawbacks as a result of the enormous dataset size.

Due to its ability to handle classification problems, grasp plain language, reduce dimensionality, and identify objects, and model motion, deep learning concepts have lately grown in favour among academics and corporate executives. DL uses multi-layer neural network approaches to mine the underlying characteristics in data from the most fundamental level to the most complicated level. They can find a huge amount of structure in the data, which allows us to present it and make inferences from it. Since autonomous cars may improve the economics of transportation networks and reduce the risk of deaths, they are also the main focus of the bulk of ITS departments and research initiatives in this area. Time savings are this idea's integrated benefit.In recent decades, safe autonomous driving has received a lot of attention. The information must be provided quickly by driver assistance systems (DAS), autonomous vehicles (AV), and traffic sign recognition (TSR).

[2] LITERATURE SURVEY

In order to identify highway events, this study offers a framework for lane-changing behaviour and other vehicle dynamics. This approach was considered when developing the vehicle-infrastructure integration (VII, also known as Intelli Drive) paradigm, which attempts to improve mobility and safety. The framework uses an in-car intelligence module based on a support vector machine to decide how the vehicle will experience its journey (SVM). RSUs (roadside units), also known as roadside infrastructure agents, collect travel data from a number of automobiles, compare the results, and compare the results to the pre-selected threshold levels to identify the occurrence.The authors provide the findings of their tests of this system in two different environments: a simulation network in rural Spartanburg, South Carolina, and an urban highway network in Baltimore, Maryland, all of which had been calibrated and confirmed beforehand. They found no discernible differences in detection performance between the old network and the new network that the VII-SVM system had never seen. They conclude that the global VII-SVM system is practical and flexible enough to be used to various transportation networks.

Utilizing real-time traffic information, modern vehicle guidance systems direct traffic and ease congestion. Sadly, these systems are only able to react when there are traffic jams and cannot prevent the unneeded creation of congestion. In that sense, anticipatory vehicle routing is promising since it allows for vehicle routing guidance while taking traffic forecast information into account. This paper presents a decentralized approach to anticipatory vehicle routing. In circumstances that are dynamic on a broad scale, this strategy is extremely helpful. The approach is based on assign multi agent systems, a technique for coordination that is focused on the environment and somewhat inspired by ant behaviour. Agents that resemble ants are responsible for the examination of the vehicles; they detect congestion forecasts and facilitate rerouting. The approach is fully examined and contrasted with three more routing strategies.The testing are conducted in a traffic simulation environment. In comparison to the test's most complex routing approach, a traffic-message-channel-based routing methodology, the studies demonstrate a notable performance gain.

The efficiency of deploying specialized short-range communications technology for automatic issue detection and travel time tracking is assessed on a portion of a rural route. The study utilized the CorSim traffic simulation tool to mimic the movement and occurrences on a portion of a rural route. The output data from the simulation was processed to provide probe and light data. An event detection system was developed using a counter and a trip time requirement. An alarm was activated when a counter reached a certain level.This method was tested on a few data sets, and the findings were utilized to establish the appropriate transit time threshold and counter alarm level levels. To determine how quickly the system could recognize various traffic situations, the algorithm was ran on the probe and beacon data using these ideal settings. The results of the experiment showed that the system was effective in promptly and precisely identifying events. Throughout the simulation and analysis, a number of parameters were altered to evaluate how they affected the stability of the system. Each parameter had a substantial impact on the detection time, and the findings that were seen were consistent with logic.In general, increasing incident severity, larger transponder population, smaller reader spacing, closer proximity of the event to the next downstream reader, and higher traffic volume all contributed to quicker times to detect an incident.

The acceleration and speed characteristics of probing cars as they go along an interstate are the foundation of the incident detection approach described in this article. It is based on the notion that a probe vehicle would slow down from its normal speed as it approaches a detectable event, then pick up speed after it has past the event. The algorithm's capacity to detect incidents at various percentages of probe cars in the traffic stream has been tested using a collection of incident data generated by a trained microscopic traffic simulation model. The results are compared to those of a multi-layer feed-forward neural network event detection system, which uses occupancy, speed, and volume measurements from fixed locations as inputs.When there are 30% probe cars present in the traffic stream, it has been found that the innovative probe vehicle approach can equal the detection rate and mean time to detection of the neural network model. How to predict future traffic is a major issue for intelligent transportation systems. Commuters must have the ability to select the optimal means of transportation, travel routes, and departure times in order to manage traffic successfully. It makes sense to enhance traffic data analysis in order to boost forecast precision. We are driven by the recent appearance of abundant traffic data and computational capability to employ deep learning approaches to improve the precision of short-term traffic forecasts. It is advised to use a new long short-term memory (LSTM) network-based traffic forecasting model.The proposed LSTM network employs a two-dimensional network with a high number of memory units to account for temporal-spatial correlation in the traffic system, in contrast to standard prediction models. The proposed LSTM network outperforms several widely used forecast models, as shown by comparison.

[3] IMPLEMENTATION

1.1 Modules Description

i) User: The user can initially register. For further chats, he required a functional user email and phone following enrollment. The administrator can activate the user after registration. Once the admin has activated them, the customer may log in to our system. After logging in, he may add the data to the traffic estimate. After entering the data, we may discover the algorithm's forecast. The random forest algorithm may thus be put after the SVM technique.

ii) Admin: Admin can sign in using his login information. Once logged in, he can activate the users. The only programmes that let the enabled user log in are ours. Forecasts generated by algorithms are under admin control. The administrator may forecast the random forest algorithm as well as the support vector machine algorithm. The administrator of the dataset may add new information.

iii)SVM: The Support Vector Machine (SVM) is a supervised machine learning technique that may be used to solve classification or regression issues. However, it is most typically used when classification problems exist. Each data point is represented using the SVM technique as a point in an n-dimensional space (where n is the number of features you have), with the value of each feature being the value of a certain coordinate. We next do classification by identifying the hyper-plane that successfully separates the two classes.

iv)Rough Forest: Random forest is comparable to a bootstrapping method utilising a CART model. Assume that there are 1000 observations for all 10 variables in the population. Random Forest makes an effort to build several CART models with varied samples and different initial conditions. For instance, a random sample of 100 observations and 5 randomly selected

3.2 Screen shots

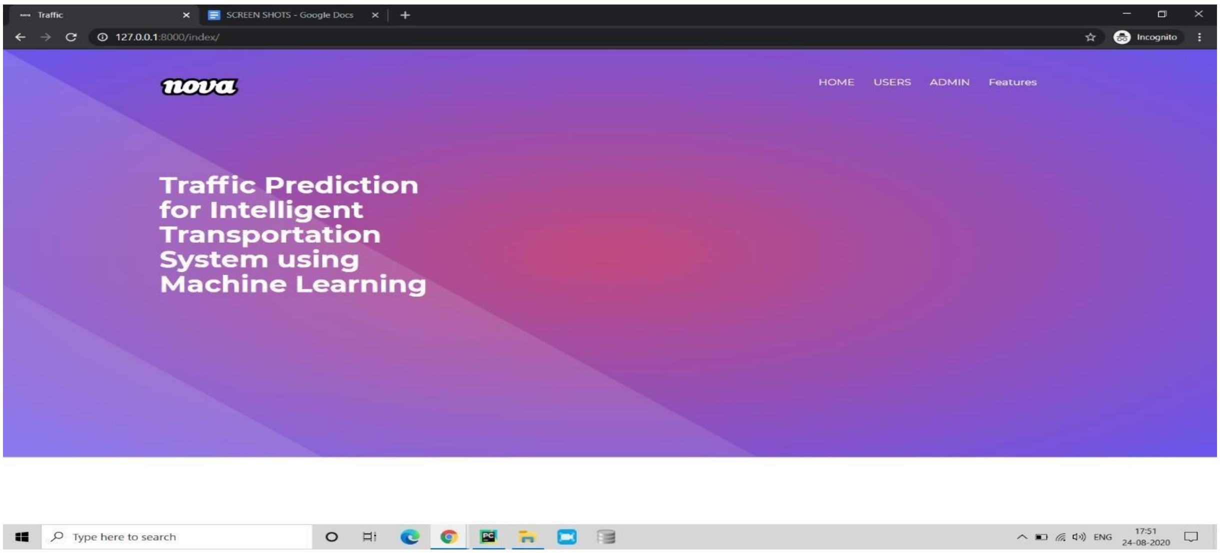


Fig.1 Home page

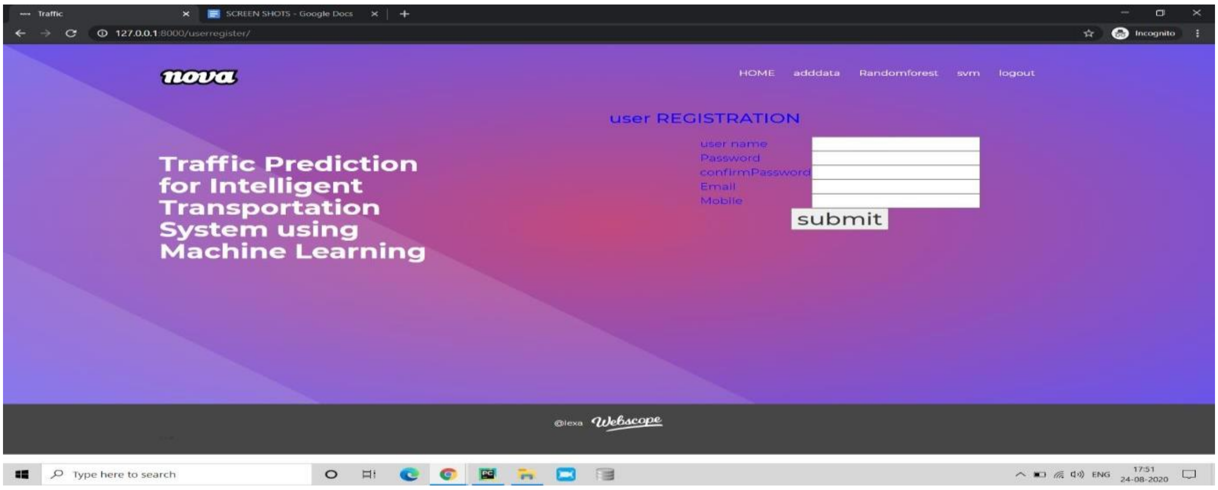


Fig. 2 User Registration Form

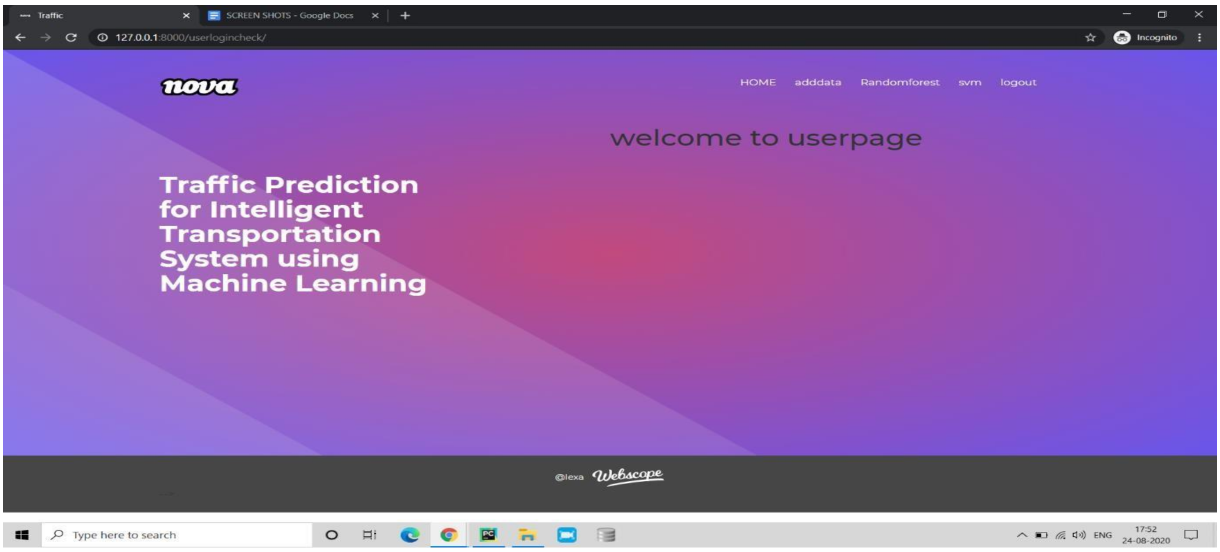


Fig. 3 User Home Page

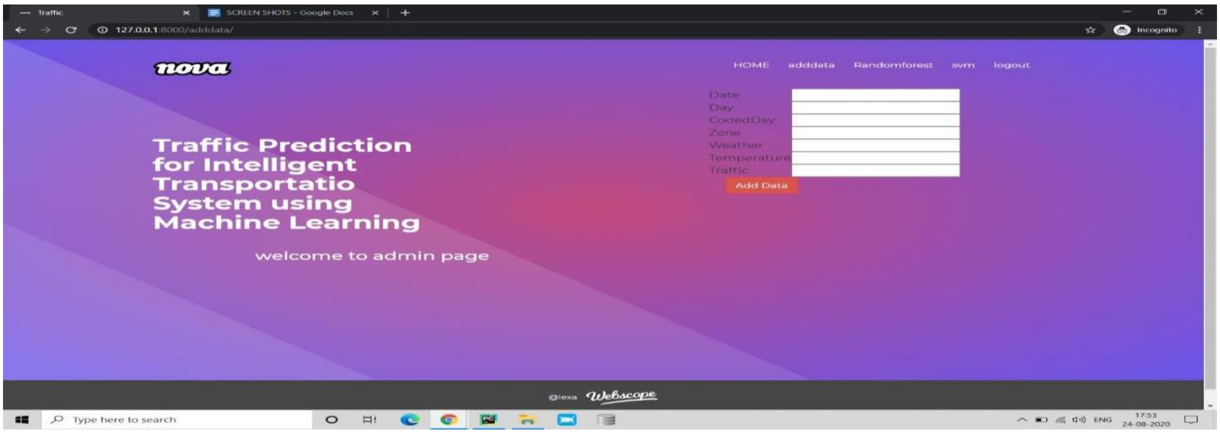


Fig. 4 :Add Data

Fig. 5 Random Forest

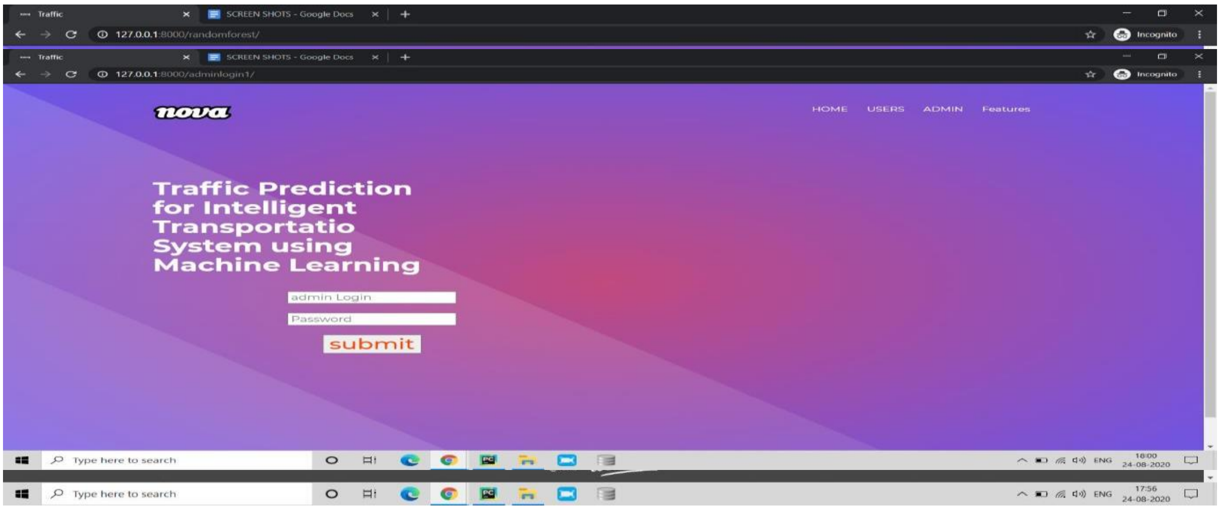
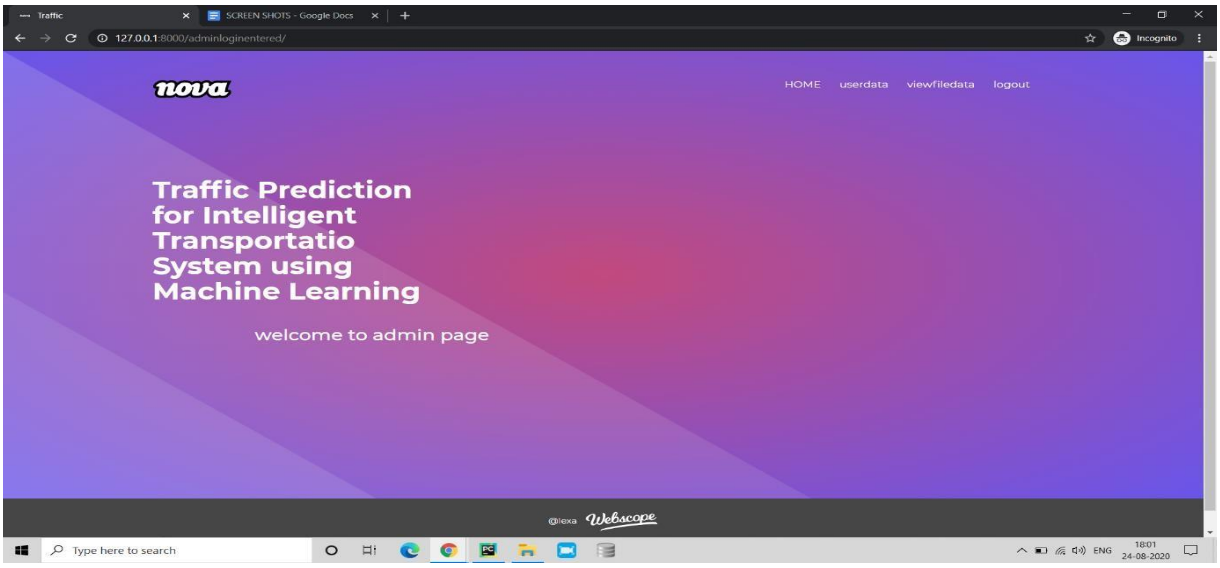


Fig. 6 Admin Login



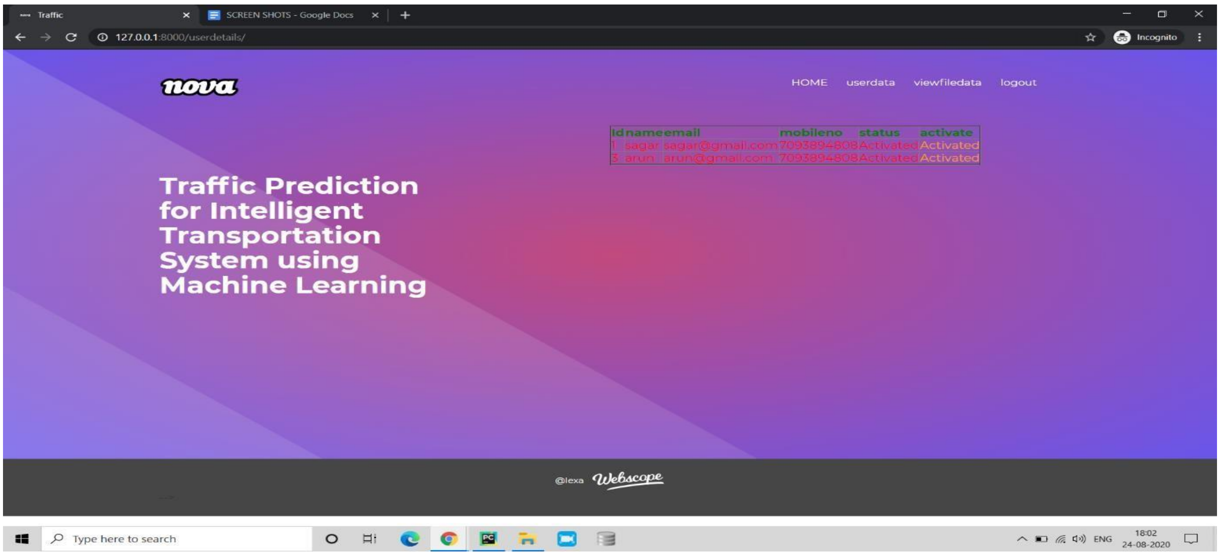


Fig. 8 User Details

[4] CONCLUSION

The Machine Learning community has not gone into great length to address deep learning and genetic algorithms, despite the fact that they are important challenges in data analysis. The recommended method is more accurate than the present techniques and addresses complexity issues throughout the whole dataset. The application and web server will work together as intended. The algorithms will also be improved for even greater precision.

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