# Traffic Prediction for Intelligent Transportation System Using Machine Learning

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**Abstract- This paper aims to develop a tool for predicting correct and timely traffic flow info. Traffic surroundings involves everything which is able to have an effect on the traffic flowing on the road, whether or not it's traffic signals, accidents, rallies, even repairing of roads which might cause a jam. If we've got previous info that is unbelievably close to approximate regarding all the on top of and plenty of of a lot of customary of living things that may have an effect on traffic then, a driver or rider will create associate au courant call. Also, it helps at intervals the means forward for autonomous vehicles. at intervals this decades, traffic knowledge area unit generating exponentially, that we've captive towards the large knowledge ideas for transportation. obtainable prediction strategies for traffic flow use some traffic prediction models and area unit still inadequate to handle real-world applications. This reality impressed United States to figure on the traffic flow forecast drawback designed on the traffic knowledge and models. it's cumbersome to forecast the traffic flow accurately as a result of the info obtainable for the transit is insanely Brobdingnagian. throughout this work, we tend to planned to use machine learning, genetic, soft computing, and deep learning algorithms to analyse the big-data for the installation with much- reduced quality.**

**Keywords:- Vehicular traffic flow prediction; Time-series; GCN; Parallel training; Sequence to sequence; Machine Learning; ITS; RNN.**

## I. INTRODUCTION

Traffic management may be a major problem which just about daily affects us. Various Business sectors and government agencies and individual travellers need precise and fittingly traffic flow data. It helps the riders and drivers to make higher travel judgement to alleviate holdup, improve traffic operation potency, and crop carbon emissions.

The dependency of traffic flow depends on period of your time traffic and historical information collected from numerous device sources.The main explanation for traffic jam is that the lack of an appropriate mechanism for prioritizing traffic. The IoT is an infrastructure network. There are switches, sensors, actuators, and circuits within the embedded systems. With software and connectivity locally or over the web helps within the transfer of datawhich are often provided by ThingSpeak API which will get the info in CSV text format. There are two sorts of congestion: structural or incidental. Structural congestion arises when traffic demand is bigger than available, while incidental congestion results from irregular circumstances like accidents, inclemency , or road work that alters traffic flow.

The ability to predict the impact of an event immediately after its occurrence s crucial to advanced traffic management and significantly improves the systems performance However, there are already several traffic flow prediction systems and models. Present traffic flow management strategies might not be adequately successful to watch the changing and continuing traffic as transportation departments face the likelihood of being lost within the increasing volume of traffic details they handle. most of them use shallow traffic models and are still somewhat failing due to the massive dataset dimension. Text Mining, also referred to as text analysis, is that the process of remodeling unstructured text into meaningful and actionable information. Machine learning models got to be equipped with input file , after which they will automatically predict with a point of precision.

 

## II. AIMS AND OBJECTIVE

### a) Aim

Aim of those applications will bring Us a safer, additional economical, and additionally additional gratifying transportation surroundings. H owever, AN correct and economical traffic flow prediction system is required to attain these applications, that creates a chance for applications below ITS to cope with the potential road scenario before. To achieve better traffic flow prediction performance, several prediction strategies are planned, such as mathematical modeling strategies, constant strategies, and non-parametric methods.

### b) Objective

The main objective of this work-study is to determine a model can do the optimum accuracy and establish the factors behind crashes or accident that might be useful to cut back accident quantitative relation in close to future and will be useful to avoid wasting several lives, support in constructing the roads infrastructure, deteriorate wealth destruction moreover as several alternative things.

## III. LITERATURE SURVEY

The literature survey deals with the topics and the researches that would help to understand the existing systems that are similar to this project.

The objective of this literature survey is to analyze the related work to this project and mechanisms used in previous studies

**Paper 1: Accelerated Incident Detection across Transportation Networks victimization Vehicle dynamics and Support Vector Machine in Cooperation with Infrastructure Agents:**

This study presents a framework for road incident detection victimization vehicle dynamics, like speed profile and lane dynamic behavior. This approach was unreal within the vehicle-infrastructure integration (VII, additionally called IntelliDrive )model within which vehicles and infrastructure communicate with one another to boost quality and safety. The framework uses Associate in Nursing in-vehicle intelligent module, supported a support vector machine (SVM), to see the vehicle's travel experiences with autonomously generated dynamics information. edge infrastructure agents (also called RSUs: edge units )sight the incident by collecting travel experiences from many vehicles and scrutiny the aggregate results with the pre-selected threshold values. The authors report on their evaluations of this method in 2 totally different environments: a antecedently tag and valid simulation network in rural Spartanburg, South Carolina; Associate in Nursingd an urban main road network in metropolis, Maryland. Their analysis found no vital variations within the detection performance between the first network and a brand new network that the VII-SVM system has not seen before. They conclude that the generic VII-SVM system is effective and applicable across transportation networks.

**Paper 2: A redistributed Approach for preceding Vehicle Routing victimization Delegate Multiagent Systems:**

Advanced vehicle steering systems use period traffic info to route traffic and to avoid congestion. Unfor- tunately, these systems will solely react upon the presence of traffic jams and to not forestall the creation of reserve congestion. preceding vehicle routing is promising in this respect, as a result of this approach permits guiding vehicle routing by accounting for traffic forecast info. This paper presents a redistributed approach for preceding vehicle routing that's notably use- Peul in large-scale dynamic environments. The approach relies on delegate multiagent systems, i.e., Associate in Nursing environment-centric co -ordination mechanism that's, in part, impressed by emmet behavior. Antlike agents explore the setting on behalf of vehicles and sight a congestion forecast, permitting vehicles to reroute. The approach is explained comprehensive and is evaluated by comparison with 3 different routing methods.

**Paper 3: Dedicated Short-Range technology for main road Incident Detection: Performance Assessment supported Traffic Simulation information**

An assessment of the employment of dedicated short-range technology to perform time period observation and automatic incident detection on a phase of rural main road is represented. The assessment used the CorSim traffic simulation tool to simulate traffic and incidents on a phase of rural main road. Output information from the simulation was subjected to postprocessing to convert it to probe and beacon information. an occurrence detection algorithmic rule was developed by employing a time period threshold and a counter. Associate in Nursing alarm was generated once a counter reached a preselected level. This algorithmic rule was tested on elect information files, and also the results were accustomed determine the optimum values of the time period threshold and also the counter alarm level. With these optimum values, the algorithmic rule was applied to the probe and beacon information to see however quickly the system might sight numerous traffic incidents

**Paper 4: FREEWAY INCIDENT DETECTION VICTIMIZATION KINEMATIC INFORMATION FROM PROBE VEHICLES:**

This paper presents an occurrence detection algorithmic rule supported the speed and acceleration profiles of probe vehicles as they move a main road. it's supported the idea that once a search vehicle approaches a detectable incident, it'll decelerate from its traditional speed then accelerate back to the traditional speed once passing the incident. The incident detection performance of the algorithmic rule, at numerous percentages of probe vehicles within the traffic stream, has been tested on a group of incident information generated by a tag microscopic traffic simulation model. The results square measure compared with a multi-layer feed-forward neural network incident detection techniques that uses volume, speed and occupancy measured at fastened locations as inputs.

## IV. EXISTINGSYSTEM

Text mining (also referred to as text analytics) is an artificial intelligence (AI) technology that transforms free (unstructured) text in documents and databases using natural language processing (NLP) into standardized, organized data suitable for analysis or to drive algorithms for machine learning. Data Transformation (feature scaling) and Dimensionality Reduction techniques (PCA) Principle component Analysis that reduces dimension of features requires by our system to design a classification model that uses classification techniques such as SVM (SUpport Vector Machine) and RandomForestClassifier that specifies the category to which data elements belong and is best used when the output has finite and discrete values.

## V. COMPARTIVE STUDY

| SR NO. | PAPER TITLE | AUTHOR NAME | METHOD | ADVANTAGE | DISADVANTAGE |
|---|---|---|---|---|---|
| 1. | Accelerated Incident Detection across Transportation Networks victimization Vehicle dynamics and Support Vector Machine in Cooperation with Infrastructure Agents | Ma, Yongchang,Chowdhury,Mashrur,Jeihani,Mansoureh,Fries, Ryan | Artificiak Neural network using hybrid learning, decision trees, DTANN. | The behavioural and route accident patterns may be helpful to develop traffic safety control policies | Data set used doesn't provide actual speed during the accident occurred. |
| 2. | A redistributed Approach for preceding Vehicle Routing victimization Delegate Multiagent Systems | Qin Yu, Tao Jiang, Aiyun Zhou, Lili Zhang,Cheng Zhang & Pan Xu | Regression problem, Random forest algorithm(a tree based algorithm). | Helps to know the causes and therefore the factors that have an effect on automobile crash severity. | Random forest algorithm provides accuracy only up to 87%. |
| 3. | Dedicated Short-Range technology for main road Incident Detection: Performance Assessment supported Traffic Simulation information | Xuehu Wang ,Yongchang Zheng ,Lan Gan,Xuan Wang,Xinting Panax quinquefolius,Xiangfeng Kong,Jie Zhao | Supervised Machine learning, Gradiet boosting. | Predicts accident risk per road phase each hour. | It does not use real time information, accidents are random occurrences. |
| 4 | Freeway incident detection victimization kinematic information from probe vehicles | Qin Yu, TaoJiang, Aiyun Zhou, Lili Zhang, Cheng Zhang & Pan Xu | Logistic Regression. | It may be effectively utilized by any devices that has less computation capability & with less resources | It requires huge past and present real time traffic information |

## VI. PROBLEM STATEMENT

Analysis of review work is classified into 2 spects of Intelligent Transport System (ITS): Transport connected problems and Techniques concerned in determination these problems.

**Transport problems:**

Increase in traffic thanks to increment has raised numerous problems like traffic control, pollution, crime management, disaster management, congestion management and correct navigation systems. numerous problems that are centered in literature review.

**Techniques for determination Transport problems:**

Various problems reportable within the Table one need real time data to resolve them. Therefore numerous technologies and techniques ar planned by numerous researchers in order to resolve them. Various active CCTV cameras and Sensors ar accustomed offer real time data.GPS technology is combined with totally different image process techniques to have a lot of advance Navigation systems.In addition to the current many advance technologies such as VANETs,cloud computing,agent based mostly computing are introduced to create transport system a lot of economical and intelligent.

## VII. PROPOSED SYSTEM

Based on the higher than mentioned approaches and techniques, we found that there ar restricted researches that:

A. Investigate the usage of cloud-based frameworks to boost the performance of the traffic management

 

B. Develop a time period application that captures the connection between completely different traffic components, like traffic lights, road signs, and road intersections.

Therefore, as a future direction, we tend to encourage researchers to propose a general framework that address the higher than limitations to boost the performance of traffic management systems. Figure four shows the abstract planned model of the longer term work due to the restrictions of some existing work.In the model, we tend to divided the town into regions and every region has some road intersections; each intersection includes a stoplight. In the proposed mode; there's a relationship between these regions and also the road intersections.This is planned system.

## VIII. ALGORITHM

The general idea of working of proposed system algorithm is given as follow:

**Step.1:** Start

**Step.2:** User Registration into application by using django forms. Each User data gets directly stores into Database Using Django Models.

code for creating user models and forms:-

class userModel(models.Model)

class userForm(models.ModelForm)

**Step.3:** Admin can login with his credentials by using Django automatic admin interface.

if the Admin is authenticated then he can activate the users.

The activated users only login our application.

we created following two function foe admin login:-

def adminlogin1(request)

def adminloginentered(request)

**Step.4:** Once the User registered then admin can activate the user.

After admin activates the user. user can login into our system

Function for user activation:-

def activateuser(request)

**Step.5:** After login user can add the data to predict traffic prediction.

For that we created Storetraffic Model and Storetrafficdata ModelForm. By using Django Models the data user adds that directly stores into the Database.

Code for creating traffic data models and forms:-

class storetrafficdata(models.Model)

class storetrafficdataForm(forms.ModelForm)

**Step 6**: Converting user addded Data into csv file for prediction code:-

def storecsvdata(request):

:

:

data_set=csv_file.read().decode('UTF-8')

**Step.7:** After storing csv file.

we split our data into training data and testing data.

Usally we split data into 70% training and 30% testing data. training data used to train our model. After training we test our models accuracy on testing data.code:-

from sklearn.model_selection import train_test_split as tts
x_train,x_test,y_train,y_test=(features,target,test_size=0.3, random_state=1)

**Step.8:** After spliting data.
We train our model on the stored available data.To train our model we make use of two different ML algorithms:
1) Support Vector Machine(SVM)
2) Random Forest
**Step.9:** After training our model.
we check whether our model is predicting approximate values or not.
We check our Model accuracy by confusion_matrix and classification_report
code:-
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix.
**Step.10:** Now as our model is ready we can predict the traffic.
Storing the results of prediction into the database.
**Step.11:** Display the results to the user.
**Step.12:** End

## IX. MATHEMATICAL MODEL

Consider the unifacial flow of vehicles on a single-lane road. associate degree intersection with different roads and therefore the presence of traffic lights are going to be taken under consideration by applicable boundary conditions. we are going to introduce associate degree Leonhard Euler system of coordinates x on the highway within the direction of the traffic flow and therefore the time t.

We will outline the mean flow density $p(x, t)$ because the quantitative relation of the world of the lane, occupied by the vehicles to the world of the entire section of the lane thought-about.

 

$$m = \int_0^L \rho dx$$

wherever h is that the breadth of the lane, L is that the length of the controlled section of the road, I is that the mean length of the vehicle, and n is that the variety of vehicles within the controlled section. Thus, the flow density introduced may be a dimensionless amount, that varies from zero to unity.We will introduce the flow speed u(x, t), which may vary from zero to the utmost allowed speed on the highway outside the systems for dominant the traffic. It follows from the definitions that the utmost density p = one corresponds to the case once the vehicles square measure much up against each other ("bumper to bumper"). during this case it's natural to require u = zero, i.e. there's a "traffic jam" on the road.

By job the number

$$\partial\rho/\partial t + \partial(\rho v)/\partial x = 0$$

the"mass" targeted in an exceedingly section of length L. we are able to write the modification in mass on the highway. For never-ending flow of vehicles we are going to have the subsequent equation of continuity

$$\partial\rho/\partial t + \partial(\rho v)/\partial x = 0$$

we are going to write the equation of the dynamics of traffic flow, a lot of precisely, the equation of the modification within the mode of motion.The modification in mode of motion of vehicles depends on the response of a driver to a modification within the road conditions and therefore the actions that he takes these factors have an effect on the mode of motion. the response of the traffic to the driver's action and therefore the technical characteristics of the vehicles. In developing the model of traffic dynamics we tend to created the subsequent main assumptions.

1. In view of the very fact that it's the typical traffic that's being delineate, and not the motion of every vehicle singly, the model operates with the typical characteristics of the vehicles, and ignores a person variations in power, inertia, braking distances, etc.

2. It's assumed that, on the average the response of all drivers to a modification within the road conditions is adequate.it is assumed that on seeing a red stoplight or a speed limitation sign, for instance, that there's a "sleeping policeman" ahead, or a pile-up of vehicles before, the motive force slows all the way down to a whole stop or to a permissible speed and doesn't still accelerate and later need to America emergency braking three.

3. It is assumed that on seeing a red stoplight or a speed limitation sign, for instance, that there's a "sleeping policeman" ahead, or a pile-up of vehicles before, the motive force slows all the way down to a whole stop or to a permissible speed and doesn't still accelerate and later need to America emergency braking three. it's assumed that each one drivers adapt the traffic rules, particularly, they are doing not exceed the utmost ordinance allowable on the road and maintain a secure distance between the vehicles, betting on the speed. The equation of the modification in speed will then be written within the kind

$$\frac{dv}{dt} = a; \quad a = \max\{-a^-, \min\{a^+, a'\}\}$$

$$a' = \sigma_0 a_\rho + (1-\sigma_0)\int_0^Y \omega(y) a_\rho(t, x+y) dy + \frac{V(\rho) - v}{\tau}, \quad a_\rho = -\frac{k^2}{\rho}\frac{\partial\rho}{\partial x}$$

Here a is that the acceleration of the traffic flow, a + is that the most doable acceleration and a- is that the emergency braking deacceleration and therefore the quantities a+ and a- square measure positive and square measure outlined by the technical characteristics of every vehicle. The parameter k> zero means the propagation speed of tiny permutations ("the speed of sound" )in traffic flow. The parameter t has the that means of the delay time because of the quality of the speed of the driver's reaction to a modification within the road conditions and therefore the technical characteristics of his vehicle. This parameter corresponds to the tendency of the motive force to take care of a speed reminiscent of the utmost safe speed V(p ) for the flow density p.

$$V(\rho) = \begin{cases} -k\ln\rho, & v < v^0_{max} \\ v^0_{max}, & v \geq v^0_{max} \end{cases}$$

The speed V(p )is set from the condition for the automobile speed V to depend upon the flow density of p for the conditions of a straightforward wave, whereas happens once the flow starts to opened up from the point0. wherever Po= one and u = zero, taking under consideration the limitation on the utmost permissible speed. the worth of the parameter t is also totally different, betting on whether or not it's necessary to deaccelerate or not.
t = r < V accelerate so as to achieve the utmost safe speed V(p), specifically.

$$\tau = \begin{cases} \tau^+, & V(\rho) < v \\ \tau^-, & V(\rho) \geq v \end{cases}$$

The remaining parameters in formulae have the subsequent meaning: Y = min is that the characteristic visibility on the flow, that depends on the climatic conditions, ro(y )is that the "weight" of the state of the flow before of the vehicle for taking a choice on whether or not to alter the kind of driving which may be outlined, for instance, as follows:

 

$$\omega(y) = \frac{\omega_0(y)}{\int_0^{Y} \omega_0(y)dy}, \quad \omega_0 = \begin{cases} 1, & 0 \le y \le Y_0 \\ 0, & y < 0,\ y > Y_0 \end{cases}$$

.

## X. SYSTEM ARCHITECTURE

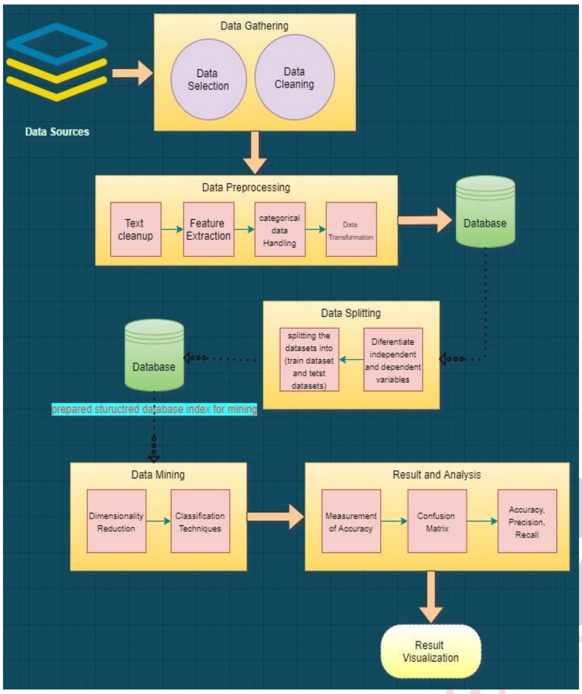


Fig.1: System Architecture

**Description:** The amount of data created is very huge and the amount of traffic information is collected through floating car data, so semantic models for data fusion and efficient algorithms for artificial intelligence are required to organize and process these data for extracting meaningful information especially from the accumulated massive historical dataset. Hence, data analyzing, and processing of raw dataset is needed in order to built accurate model.

Machine learning could be a set of algorithms and applied math models that square measure utilized by computers to perform a needed task. Machine learning are often employed in traffic prediction. the info collected may be employed in the development of a plan show current traffic within the town and will be employed in the long run in creating predictions of traffic & a congestion analysis are often done.

Text mining (also said as text analytics )is a synthetic intelligence (AI )technology that transforms free (unstructured )text in documents and databases exploitation linguistic communication process (NLP )into standardized, organized information appropriate for analysis or to drive algorithms for machine learning.

## XI. ADVANATGES

1) The behavioural and route accident patterns may be helpful to develop traffic safety control policies.

2) Helps to know the causes and therefore the factors that have an effect on automobile crash severity.

3) Predicts accident risk per road phase each hour

## XII. DESIGN DETAILS

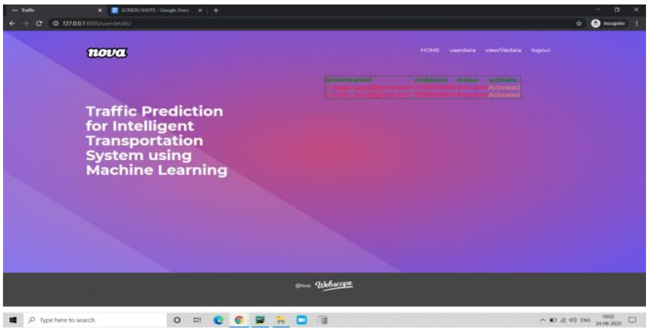


Fig.1: User Details Page

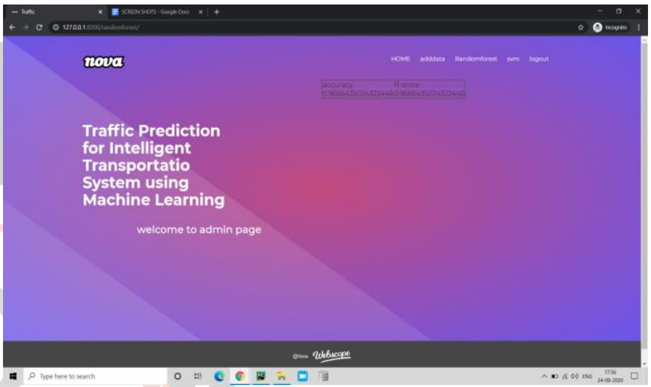


Fig.2: Randomforest Page

## XIII. CONCLUSION

We have try to implement paper " Traffic Prediction for Intelligent Transportation Syatem using Machine Learning " Author is Gaurav Meena, Deepanjali Sharma, Mehul Mahrishi and coclusion is as follow. In this paper, we have presented an urban traffic flow prediction model that explored the effectiveness of integrating rich information obtained from real world.There are several Text Mining approaches has been performed to analyze different real datasets.Two algorithms applied to get the optimum classifiers used in this model such as (Random Forest, Support Vector Machine (SVM)).

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