iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VIII **Month of publication:** August 2020

DOI: https://doi.org/10.22214/ijraset.2020.30846

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VIII Aug 2020- Available at www.ijraset.com

Analysis and Visualization of Road Accidents

Pranav Rajendra Naphad[1], Shubham Salunkhe[2]
[1]*Computer Engineering, Mumbai University*
[2]*Computer Engineering Pune University*

Abstract: ***There is an increase in number of road accidents in modern days and with the increase in the accident rates there has been a huge generation of data regarding these accidents. There are many factors that can be the cause of accidents happening such as road condition, traffic control, load on vehicle etc. Other factors might be due to the driver's carelessness and effect of drug usage. Also location, light condition, traffic type (manual/automatic), road condition etc. also has an impact on number of accidents in a particular area. These factors need to be analysed to get an idea regarding the impact these factors have on the accidents. For e.g.: - if we want to analyse the impact of light conditions or the road conditions on the no of accidents happening. With the advancement in data mining tools it is easier to analyse the impact that these factors have on the number of accidents by use of some graphs or plots. We can also find the relation between the no of causalities and how each of these contributes to number of causalities in a particular area. In this paper we try to analyse the dataset on basis of some of these factors and try to find the severity of accidents depending on some of the above factors.***
Keywords: Data mining, Logistic Regression, Decision Tree algorithms

I. INTRODUCTION

This document is a template. For questions on paper guidelines, please contact us via e-mail___ There has been an increase in the amount of data's generated in terms of volume, velocity, variety in various fields such as social media etc. In this paper we have taken accident dataset between a fixed period of time and analysed the no of accident and the severity or no of causalities in that particular and we come with some kind of analysis that which factors are contributing to most of the accidents or causality in that particular area. Some of the major causes that contribute to the accidents include the physical condition of the roads, the light condition in the particular area, the road type, the type of traffic in that area i.e. it can be manual control or it can be automatic. Also the driver condition does matter that he might be in a subconscious mind or he might under effect of drug or alcohol. Data mining tools or algorithm have become more useful for such kind of huge data and come up with some analysis. The analysis includes taking these factors as parameters and performing some kind of relation between these factors and how they contribute to the severity of accident. We also take some other parameters such as age group of the victims. These analysis results can be shown in form of some graphs or plots like bar plots and come up with some kind of visualization. Then we will be able to analyse which of these factors contribute most to the increase in no of factors and which contributes to the most no of causalities in that particular area. We use some statistical tools such as regression and other important statistical methods to come up with some analysis. Hence use of statistics and data mining techniques is the important part to come up with these kind of analysis and coming up with some kind of visualization. These statistical and data mining works are done using python.

II. RELATED WORKS

The main focus of paper [1] was analysing the factors that affected road accidents and then tried to estimate which factors are most likely to cause accidents in a particular area. The factors they took included careless driving, bad road condition, drugs or medicine, drunken driving, traffic, defect in vehicle. They used WEKA tool. Their conclusion was that drugs and medicine contributed most to accidents. In the [2] paper they have used some data mining techniques to predict accident prone zones and road conditions and they have used statistical tools like correlation analysis and came up with some bar plots and scatterplots to find the relation between the type of roads and frequency of accidents. They used R programming for visualizing the data's. They examined the impact on different kind of roads such as state highways etc. and came to the conclusion which contributed most to accidents

In the [3] paper some of the properties or features which are responsible for causing of road accident and causalities were predicted or analysed. Use of big data framework such as Hadoop mapreduce was used. The factors taken were vehicle condition, road condition and other environmental condition like wet roads or driver physical condition. Some machine learning algorithm such as regression was used and statistical tool like correlation was used to find the relation between these features. In the [4] paper the relationship between causality rate and other attributes including collision manner, weather, surface condition, light condition, and drunk driver were investigated. The data mining algorithm used was k-means clustering and some machine learning techniques like naïve Bayes classifier was used.

©IJRASET: All Rights are Reserved

They developed some plots that showed the fatal accidents in different months and the factors like weather, road type, amount of light, and other physical problems like whether drunk or not. From the graphs and analysis techniques they concluded that factors like alcohol consumption and careless driving were main cause for accidents.

III.METHODOLOGY USED

In this section, we are going to analyse & visualize different factor which should be considered while analysing accident data. Visualization of factors is important and easy to understand effect of those factors on accident count. On visualized data, we can decide which factors out of total factors to be used for analysis purpose.

Fig. 1 Accidents on the day of a week

A. Day of Week

From data of day on which accident happened, we have plot histogram in Fig.1. So, we can see that, Day of the week factor is not affecting that much on accident count. But, statistically On Thursday, Accident count is more as compare to other days.

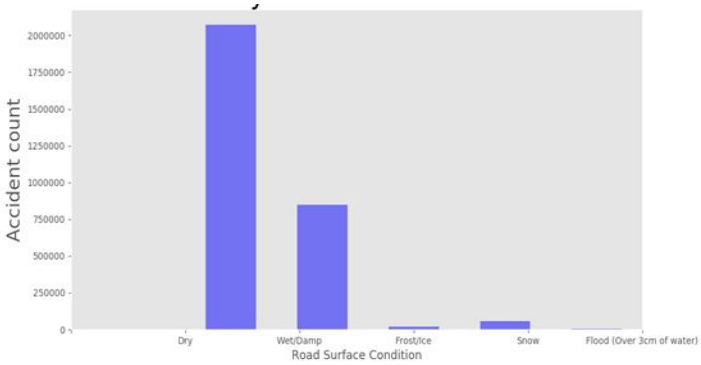


Fig. 2 Accidents analysis based on Road conditions

B. Road Condition

Road conditions differ from season to season. So from histogram Fig.2, Accident count on Dry and Wet/Damp road is serious as compare to frost/ice, snow and flood. But if we compare road conditions Dry and Wet/Damp, we can say that on Dry road accident count is more because over speeding chances more on dry road as compare to wet road.

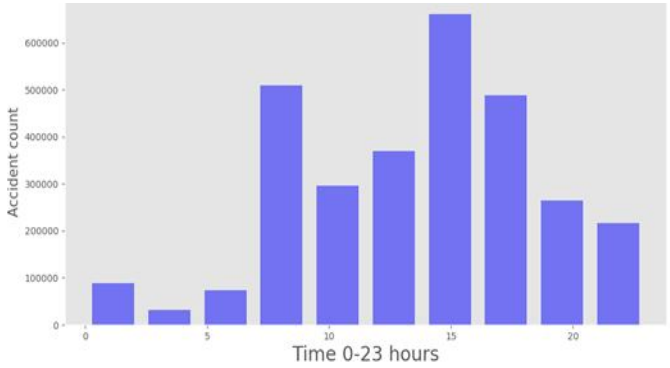


Fig. 3 Time of the day or Night

©IJRASET: All Rights are Reserved

C. Time of the day/night

As we can see in Fig.3, there is visualization of accident count vs. Time/hours of day. So, we can say that between rush hours like 8 AM to 10 AM and 3 PM to 7 PM, accident count is increasing. At night time, accident count is less as compare to day time because traffic on road less at night as compare to day.

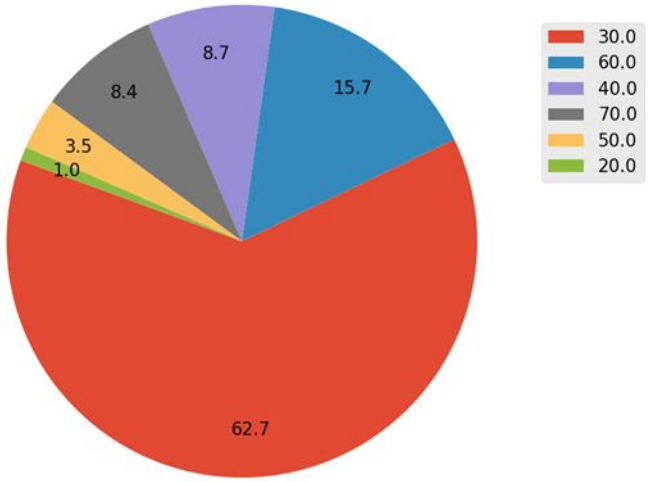


Fig. 4 Accidents percentage in Speed Zone

D. Speed Limit

Most of the accident happened on road with speed limit 30 as per pie-chart in Fig. 4. So, over-speeding and crossing speed limit on roads with speed limit 30 is one of the reason behind increase in accident count which is 62.7% of total accident count. In speed limit 30-50, accident count is moderate but if speed limit increases to 60 accident count percentage reaches to 15.7%. So, due to not following speed limit rule, accident count increases.

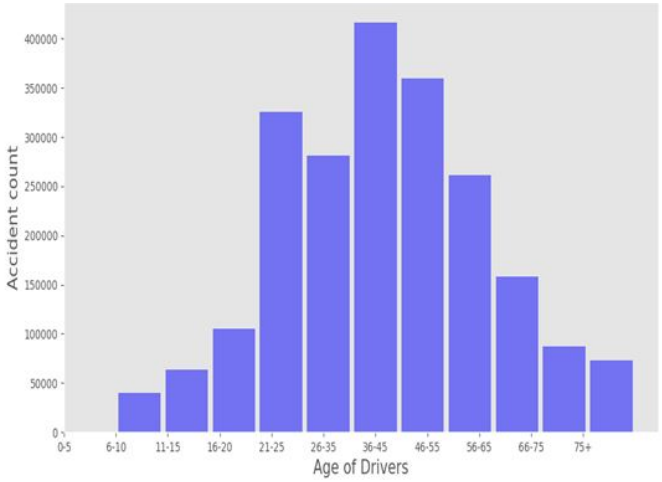


Fig. 5 Age of People involved in accidents

E. Age of People Involved in Accident

From Fig.5, it visualizes that Accident count based on age of driver. So, histogram gives information that under age drivers involved in accident are there. But which are less as compare to people of age between 20-55 involved in accident. In that also, people of age between 36-45 are more as compare to other age band. Working & college students age group people mostly involved in accident. Ages after 60 peoples are less involved in accident.

©IJRASET: All Rights are Reserved

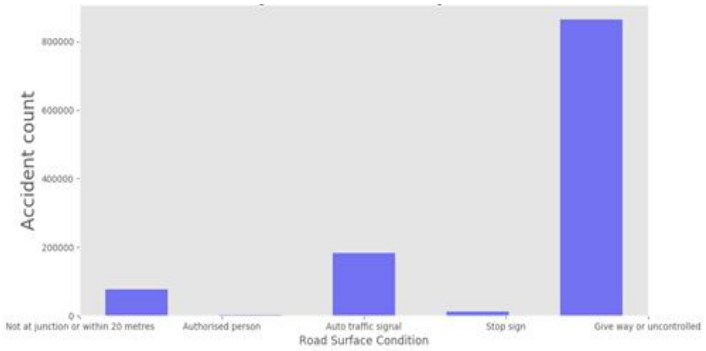


Fig. 6 Accidents based on Junction controls.

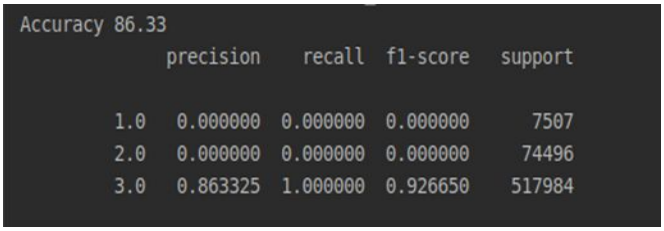
F. Junction/Signal Control

With change in junction control technique, accident count changes as per Fig.6. if junction controlled by authorized person like traffic police, then accident count is less as compare to other types of junction controlled. But from histogram we can say that due to uncontrolled junction, there is drastic change in accident count. In case of Auto traffic signal, accident count is more than junction controlled by authorized person. The main reason behind it lack of technology in signal automation.

IV. RESULT AND DISCUSSION

Dependent Factors	Correlation Coefficient
Accident_Severity	1.000000
Number_of_Vehicles	0.074951
Weather_Conditions	0.021433
Road_Surface_Conditions	0.010136
Day_of_Week	0.002552
Road_Type	-0.039005
Light_Conditions	-0.063311
Number_of_Casualties	-0.080690
Speed_limit	-0.080690

If we found correlation of different factors with Accident Severity, then we got above results in Table 5 Number of vehicles involved in accident, weather condition, Road surface condition and Day of week positively correlate with respect to Accident Severity, but other factors negatively correlate.



Accuracy 86.33

	precision	recall	f1-score	support
1.0	0.000000	0.000000	0.000000	7507
2.0	0.000000	0.000000	0.000000	74496
3.0	0.863325	1.000000	0.926650	517984

Fig. 7

According to Fig.7, logistic regression on data gives results in form of precision, recall, f1-score and support. So, Accuracy of applied algorithm is 86.23%. Precision score gives the level of prediction made by the model is precise for each accident severity. Recall value of model is the amount out of total dataset up-to which it can predict the outcome. F1 and Support scores are the amount of data tested for the predictions.

©IJRASET: All Rights are Reserved

Accuracy 77.27

	precision	recall	f1-score	support
1.0	0.032724	0.038631	0.035433	7507
2.0	0.156384	0.150021	0.153137	74496
3.0	0.870071	0.872886	0.871476	517984

Predicted	1.0	2.0	3.0	All
Actual				
1.0	290	1450	5767	7507
2.0	1568	11176	61752	74496
3.0	7004	58839	452141	517984
All	8862	71465	519660	599987

Fig.8

Fig 8 gives result of Decision tree classifier, which gives 77.27% accuracy which is less than logistic regression but precision and recall for each severity is good as compare to logistic regression. Also Confusion matrix gives good results. Performance of a prediction model is described by Confusion matrix table. A confusion matrix contains the actual values and predicted values. For severity 1, 7507 out of 8862 records are predicted by classifier and mostly accurate result to other severity.

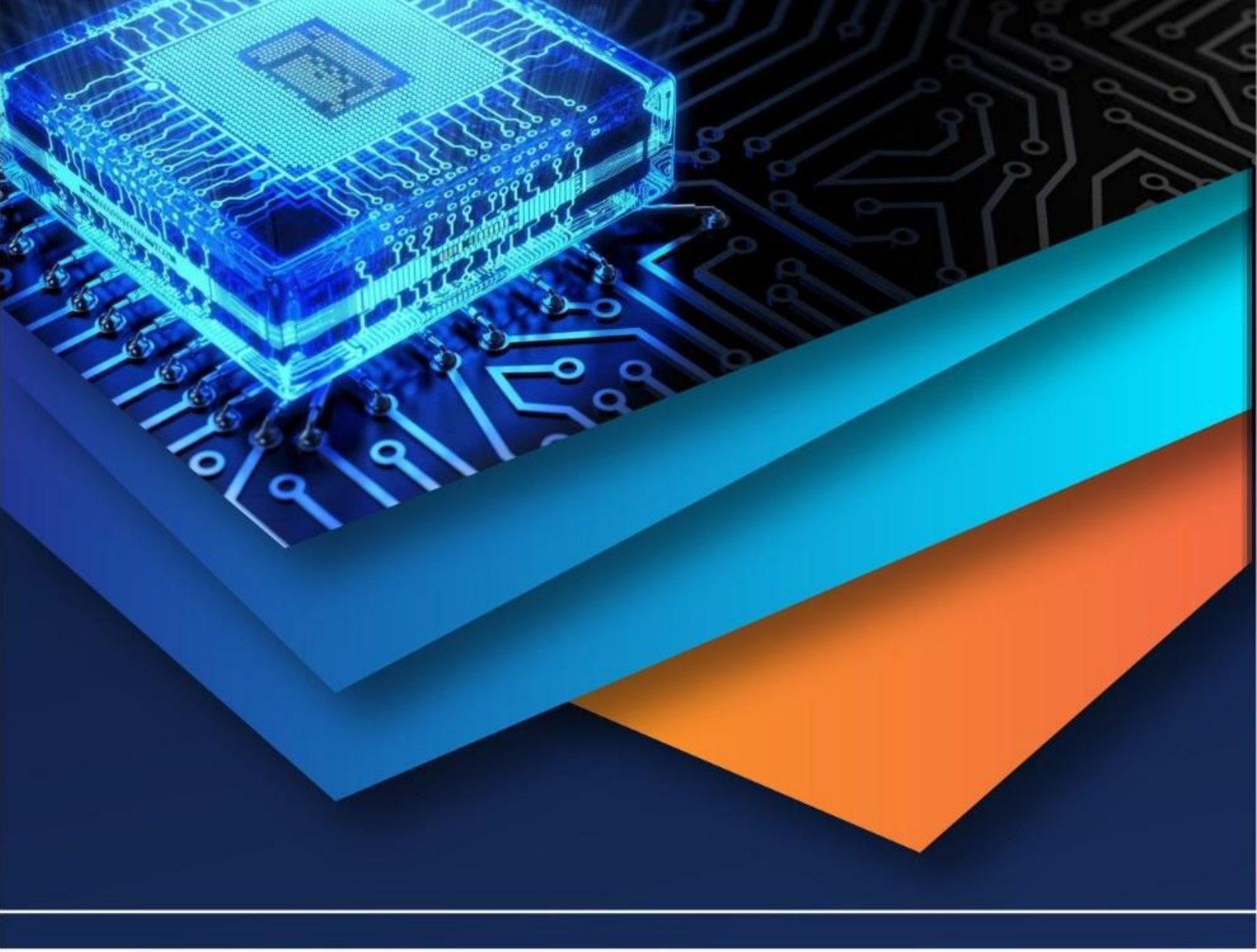
V. CONCLUSION

As we have predicted accident severity based on implemented Logistic Regression and Decision Tree algorithms. As we tried two different algorithms to predict the accident severity. It was clear that Decision tree performed much better in terms of predicting all classes of accident severity. Logistic Regression has better accuracy than Decision tree but it does not mean it did better. In Overall analysis, we can say that Junction Control, Road conditions and Time are the factors which are mostly effect on accident count. But Day of the week and Speed limit factors are not affecting that much. Weather condition and Road type also positively affect accident severity.

REFERENCES

[1] Suwarna Gothane,M.V. Sarode's "Analysing Factors, Construction of Dataset, Estimating Importance of Factor, and Generation of Association Rules for Indian Road Accident," IEEE, Feb 1, 2016
[2] Gagandeep Kaur, Er. Harpreet Kaur's "Prediction of the cause of accident and accident prone location on roads using data mining techniques," IEEE, Jul 1, 2017
[3] Rishi Sai Reddy Sudireddy's **"**Prediction of Road Accidents using Correlation based on Map Reducing," IEEE
[4] Liling Li, Sharad Shrestha, Gongzhu Hu's "Analysis of Road Traffic Fatal Accidents Using Data Mining Techniques," IEEE, June 7-9, 2017
[5] Fan Fan, Yu-Bin Qian's "Analysis of Factors Affecting the Severity of Car Accidents at iNtersections Based on Cumulative Logistic Model," IEEE, Dec 25-27, 2017.
[6] Nagarjuna R Vatti, PrasannaLakshmi Vatti, Rambabu Vatti, Chandrashekhar Garde's "Smart Road Accident Detection and communication System," IEEE, March 1-3, 2018.
[7] Jianhong Xu, Fujian Wang, Xipeng Wang's "The analysis of accident black spot at the intersection of NO. 320 state road crossed with Lingjia Bridge," IEEE, July 15-17, 2011.
[8] Youhee Choi, Jeong-Ho Park, Byungtae Jang's "Developing safety checklists for predicting accidents," IEEE, Oct. 17-19, 2018.
[9] Jihua Ye, Yanhui Zhou, Ming Li, Chunlan Wang's "Research and implement of traffic accident analysis system based on accident black spot," IEEE, Aug. 24-27, 2010.
[10] Leena Rupesh, Aarti Jain, Subham Sarda, Shivam Gupta, S.I. Sajeesh, Dhayanithi Palanisamy's "IoT and Cloud Based Integrated System for Accident Reporting and Vehicular Health Monitoring," Nov. 22-23, 2018.
[11] Yang Yanbin, Zhou Lijuan, Leng Mengjun, Sun Ling's "Early Warning of Traffic Accident in Shanghai Based on Large Data Set Mining," IEEE.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)