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Accident Possibility Indicator in Machine Learning Using Decision Tree Classifier Technique

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Abstract:- The main aspect of the project is to indicate accident possibility to the driver by using machine learning algorithms. This is useful to reduce road accidents pose significant threats to public safety, and predicting the likelihood of accidents can play a crucial role in implementing preventive measures. This project focuses on developing a Road Accident Prediction System using machine learning techniques.

By considering the road conditions, weather conditions, speed, traffic density, time of day, junction type, month, road quality, vehicle type, population density, age of the driver, alcohol or drug influence, and vehicle condition.

In addition, the system enables real-time predictions through user interaction, allowing individuals to input specific conditions and receive instant assessments of accident risk. This interactive feature enhances user engagement and awareness regarding potential risks associated with varying road scenarios.

The abstracted model serves as a foundation for more advanced predictive systems, fostering the development of proactive safety measures and contributing to the overall enhancement of road safety. The project emphasizes the importance of leveraging machine learning for accident prediction and encourages further exploration in the domain of intelligent transportation systems.

Here we are using ml algorithms Decision tree, Clustering, Regression Models, Anomaly Detection and using readings of the Sensors to measure weather conditions, vehicle speed,road conditions that are used to detect the potholes on the roads and these data are collected and train the dataset by using algorithms.

Keywords:- *Road Accident Prediction, Prevention, Weather Conditions, Speed Detection, Population Density, Alocholor Drug Influence, Machine Learning Algorithms and IOT sensors.*

I. INTRODUCTION

Accident Possibility Indicator is an innovative Machine Learning project designed to predict the likelihood of an accident occurring based on various contextual constraints such as speed, road conditions, traffic density, and other relevant factors. With the increasing rate of road accidents globally, there is a pressing need for proactive measures to mitigate risks and enhance road safety. The main aspect of this project is to reduce road accidents pose significant threats to public safety, and predicting the likelihood of accidents can play a crucial role in implementing preventive measures.

This project focuses on the development of a Road Accident Prediction System leveraging machine learning techniques. The primary objective is to provide drivers with real-time indications of accident possibilities, thereby empowering them to take proactive measures to avoid potential hazards. By integrating various factors such as road and weather conditions, traffic density, vehicle speed, and driver-related variables, the system aims to generate accurate assessments of accident risks.

The significance of this project lies in its potential to contribute to the reduction of road accidents through proactive intervention. By harnessing the power of machine learning algorithms, the system can analyze vast amounts of data collected from sensors installed in vehicles and road infrastructure. This data includes readings on weather conditions, road quality, vehicle speed, and other relevant parameters, which are crucial for predicting accident likelihood.

Furthermore, the project emphasizes user engagement and awareness by enabling real-time predictions through user interaction. By allowing individuals to input specific conditions and receive instant assessments of accident risk, the system enhances user understanding of potential hazards associated with different road scenarios. This interactive feature not only empowers drivers to make informed decisions but also fosters a culture of safety consciousness on the roads.

The methodology employed in this project encompasses a range of machine learning algorithms, including Decision Trees, Clustering, Regression Models, and Anomaly Detection. These algorithms are trained on datasets comprising various parameters related to road accidents, allowing for the accurate prediction of accident probabilities. Additionally, the integration of Internet of Things (IoT) sensors further enhances data collection capabilities, providing real-time insights into changing road conditions.

Overall, this project serves as a foundation for the development of advanced predictive systems aimed at enhancing road safety. By leveraging machine learning algorithms and IoT technology, the system offers a proactive approach to accident prevention, ultimately contributing to the overall improvement of public safety on the roads. Through continuous research and innovation in the domain of intelligent transportation systems, the project underscores the importance of technology in addressing contemporary challenges in road safety.

II. LITERATURE SURVEY

[1]. C. Dong, C. Shao, H. Huang, X. Chen, and N. N. Sze, said that for the present, as well as for transitory and future transportation systems, traffic safety poses a major challenge because of the potential for sophisticated automation and communication systems in cars and the road infrastructure to impede individual drivers' driving habits and cause safety concerns. It is practically essential to create improved traffic safety procedures, plans, and regulations in order to lower crash rates, enhance the efficiency of the transportation system, and potentially lessen traffic congestion and air pollution caused by vehicles. Traffic safety research will significantly advance our scientific understanding of the novel interactions and phenomena between conventional, connected, and automated vehicles. This research is made possible by emerging vehicle, sensing, and control technologies, big data analytics, Smart City research initiatives, and recent developments in driving experiments.

[2]. Ali, F.; Ali, A.; Imran, M.; Naqvi, R.A.; Siddiqi, M.H.; Kwak, K.-S said that restoring traffic flow and lowering serious injuries and fatalities require accurate traffic accident detection and condition analysis. An advanced data categorization model with a rich source of traffic data can be used to achieve this purpose. A number of sensor-and social networking platform-based traffic event detection and condition monitoring systems have recently been introduced. Sensor-based systems, on the other hand, have a low information capacity and a high false-alarm rate, which can lead to system failure. Social networking data also include idioms, jargon, and changing themes in addition to being unstructured and unpredictable. It is possible that important information is not extracted from social networking data by the machine learning algorithms used for traffic event detection. This study proposes a real-time monitoring architecture based on social networks.

[3]. F. Zong, H. Zhang, H. Xu, X. Zhu, and L. Wang said that the study proposes a model system that uses the Hazard model and the Ordered Probit model, respectively, to forecast the duration and severity of traffic accidents. 2010 data on road accidents gathered in China's Jilin province is used to estimate the models. Three severity indicators—number of fatalities, number of injuries, and property damage—as well as the length of the accident are predicted using the proposed models, and the key influences of associated variables are found. The findings show that when it comes to severity modeling, the Ordered Probit model has a higher goodness-of-fit than the SVC model. Furthermore, the severity of the event has been shown to be a significant factor in determining its duration; that is, longer durations are associated with higher numbers of fatalities and injuries. The outcomes of studies can be used to forecast

[4]. Chand, A.; Jayesh, S.; Bhasi said that road traffic accidents are one among the world's leading causes of injuries and fatalities and hence represent an important field of research towards the use of traffic accident analysis and prediction techniques and the determination of the most key factors contributing to road traffic accidents. This paper aims to provide an overview of road accident data sources, data analysis techniques, various algorithms used to build road accident forecasts, and also their suitability to the types of data being examined with the ease of interpretation. The paper also summarizes the operational problems of road traffic, identifies the risk factors, the efficacy of road safety measures when they contribute to the statistical analysis of the severity of motor vehicle accidents and offers an assessment of future methodological approaches. In this review, different gaps in the road traffic accident area were found and further fields of research have been mentioned.

III. METHODOLOGY

➢ *Data collection:*

This dataset includes information about accidents such as gender, road conditions, weather conditions, speed, traffic density, time of day, junction type, month, population density, and alcohol or drug influence. Based on the attributes we can predict it. And the dataset is prepared by own:

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	Gender	Road Conditions	Wheather Conditions	speed	Traffic density	Time of Day	Junction Type	Month	population density	Alcohol or Drug influence	Accident
2	0	0	1	80	1	0	3	5	0	0	0
3	1	1	2	85	0	1	2	4	0	1	1
4	0	2	2	120	0	3	0	5	1	1	1
5	0	0	1	68	0	4	2	3	1	0	0
6	1	0	3	110	2	5	1	2	1	0	1
7	0	1	2	90	2	6	3	1	2	0	1
8	0	1	0	75	2	7	4	5	2	1	1
9	1	2	0	82	1	8	2	6	1	0	0
10	1	0	3	60	1	9	0	8	1	0	0
11	0	1	1	70	2	10	1	2	2	1	0
12	0	2	0	120	1	11	0	11	1	1	0
13	1	0	3	100	0	12	1	12	2	0	1
14	0	0	0	65	2	13	2	1	2	0	0
15	0	1	2	75	1	14	4	9	0	1	1
16	1	2	3	80	0	15	0	9	0	0	1
17	1	0	1	45	1	16	3	7	1	0	0
18	0	2	0	50	1	17	1	3	2	1	0
19	0	1	2	35	2	18	4	6	2	1	0
20	0	0	1	65	2	19	2	11	2	1	1
21	1	1	3	92	0	20	0	2	0	1	1
22	1	2	0	110	2	21	4	1	2	0	0

Table-1:referring the data set for the model

➢ *Feature Selection:*

Relevant features are selected based on their importance in predicting accidents. Features such as road conditions, weather conditions, speed, traffic density, and time of day are identified as crucial factors in determining accident likelihood.

➢ *Algorithm used:*

Here we can use a Decision tree machine learning algorthim.

➢ *Model Training:*

A Decision Tree Classifier is chosen as the machine learning model due to its ability to handle both numerical and categorical features and its interpretability. The classifier is instantiated, and then trained on the training data using the fit method.

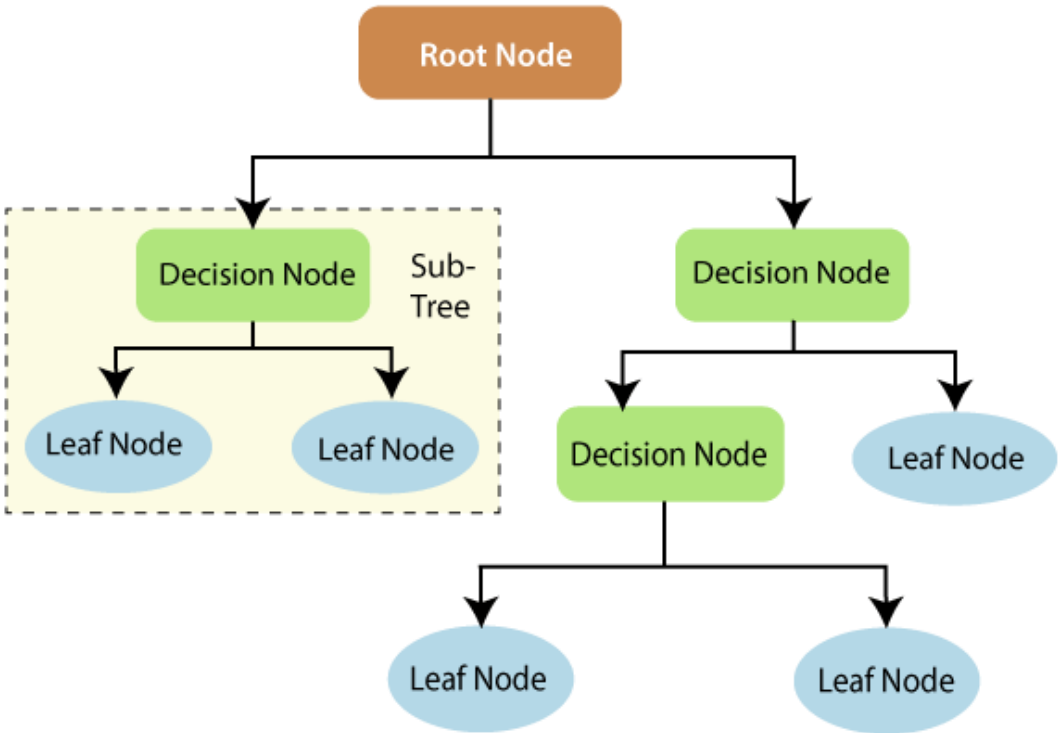

Fig-1:show's that how the Decision tree Algorithm works.

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➢ *Decision Tree Method:*

The below code describes the split the data and training it and testing it.

```
# Split the data into training and testing sets and applying Decision tree
X = df .drop ('Accident', axis=1)  # Features
y = df['Accident']  # Target variable
X _train, X _test, y _train, y _test = train _test _split(X, y, test _size=0.2, random _state=42)
clf = Decision Tree Classifier()
clf.fit(X _train, y _train)
y _ pred = clf .predict(X _test)
accuracy = metrics .accuracy _score(y _test, y _pred)
print("Accuracy:", accuracy)
tree _rules = export _text( clf , feature _names=list( X .columns ) )
                print(tree_rules)
```

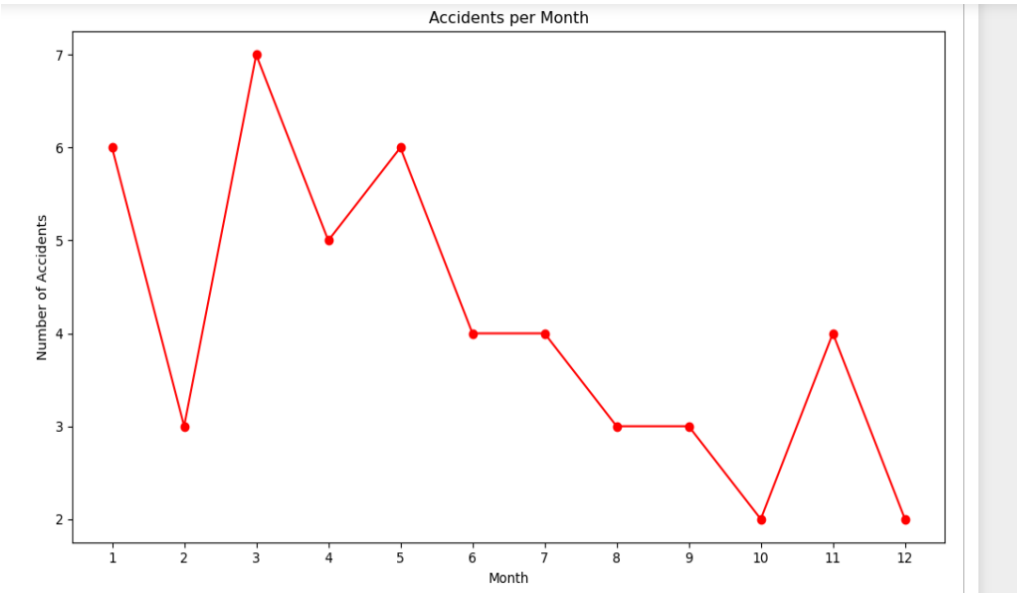

Fig-2:Show's the Accidents in each month , basing on the fig-1 dataset.

➢ *User Input:*

The user is prompted to input relevant information such as gender, road conditions, weather conditions, speed, traffic density, time of day, junction type, month, population density, and alcohol or drug influence.

➢ *Making & Displaying predictions:*

Using the trained decision tree classifier, predictions are made based on the user's input. The model predicts whether an accident is likely to occur given the provided input.The predicted outcome (whether an accident is likely or not) is displayed to the user.

IV. CONCLUSION

In conclusion, the code implements a basic Accident Possibility Indicator using a Decision Tree Classifier. By inputting user data, it provides personalized predictions. While the model's simplicity allows for easy understanding, future improvements could enhance its accuracy and usability for better road safety management.

Moving forward, the project could be extended to incorporate additional features, refine the model using more advanced machine learning techniques, and integrate with existing road safety systems for wider adoption and impact.

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