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A ROAD ACCIDENT PREDICTION MODEL USING DATA MINING TECHNIQUES

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ABSTRACT; The exponential increase in the number of vehicles on the road has led to a corresponding rise in traffic accidents, making it essential to predict accident occurrences for better decision-making by transportation authorities. Forecasting traffic accidents can help in developing strategies to reduce such incidents and enhance public safety. Although accidents are inherently uncertain, patterns of regularity can often be observed over time, allowing for more informed predictions. This study explores the relationships between road accidents, road conditions, and environmental factors, aiming to develop an accident prediction model. Using data mining techniques, specifically the Apriori algorithm and Support Vector Machines (SVM), the study analyzes accident data from Bangalore's roads between 2014 and 2017. The Apriori algorithm, a rule mining technique, helps identify frequent patterns in accident occurrences, while SVM is used for classification to predict the likelihood of accidents based on various factors. The results of the study provide valuable insights into the contributing factors to road accidents and the underlying patterns that can help in forecasting future incidents. The predictive models developed through this research can be useful for a range of stakeholders, including government agencies, public works departments, contractors, and automobile manufacturers, to design safer roads, improve vehicle safety features, and plan preventive measures based on predictive accident data. By leveraging data mining techniques, this study aims to provide a scientific approach to traffic accident prediction, thereby contributing to better road safety and accident prevention strategies. The findings from this research have the potential to influence road infrastructure design, traffic management, and public policy, ultimately leading to a reduction in traffic-related fatalities and injuries.

I. INTRODUCTION: The increasing rate of road accidents in India has become a serious cause for concern, with the country accounting for about six percent of global road accidents despite owning only one percent of the world's vehicle population. This alarming statistic highlights the critical need for effective accident prediction models to help mitigate the rise in accidents. Factors such as negligence by two-wheeler riders, overspeeding, driving under the influence of alcohol, and general traffic violations are significant contributors to road accidents. Additionally, poor road conditions, inadequate vehicle maintenance, and the lack of safety measures, such as wearing helmets, further exacerbate the problem. Although the rapid increase in the number of vehicles is often cited as a primary cause, environmental factors such as adverse weather conditions, including rain and fog, also play a pivotal role in increasing accident risk. The number of fatalities due to road accidents in India is staggering, with over 137,000 deaths annually, a figure that far surpasses the death toll from terrorism. Among the deadliest

types of accidents are those involving heavy vehicles like trucks and commercial vehicles, including buses, which often claim innocent lives due to their large size and mass. Given this grim situation, it is crucial to have a proper estimation of accident occurrences and to identify accident hotspots and contributing factors. By understanding the causes and locations of accidents, targeted interventions can be devised to reduce accidents and enhance road safety. To achieve this, developing an optimized accident prediction model is essential. Such a model could analyze various factors contributing to accidents, such as road conditions, vehicle types, environmental conditions, and driver behavior. However, building such a model is not without challenges, as it requires evaluating the weight of each variable's impact on accidents and designing the model to incorporate these variables effectively. Data mining techniques have proven to be highly effective in extracting useful information from large datasets in various fields, such as credit risk management, fraud detection, and healthcare informatics. Similarly, data mining can be applied to accident prediction by analyzing historical accident data, identifying patterns, and predicting future occurrences. Machine learning and artificial intelligence techniques further enhance the predictive power of these models, enabling them to adapt to changing conditions and refine predictions over time. This paper explores the interrelationships between road accidents, road conditions, and environmental factors in the Indian context, highlighting the potential of data mining and machine learning techniques to develop accurate prediction models. The study also discusses the challenges of building such models, including the need to process large datasets and interpret complex relationships between different variables. By leveraging data mining techniques, the research aims to provide valuable insights into accident risk factors and propose a model capable of estimating the likelihood of accidents in specific areas, helping to prevent accidents and improve road safety.

II. LITERATURE SURVEY

A) Anand, J. V. "A Methodology of Atmospheric Deterioration Forecasting and Evaluation through Data Mining and Business Intelligence." Journal of Ubiquitous Computing and Communication Technologies (UCCT) 2, no. 02 (2020): 79-87.

The study introduces a methodology for forecasting atmospheric deterioration using data mining techniques and business intelligence tools. The objective of the research is to provide an efficient and accurate approach for predicting atmospheric conditions that can lead to deterioration in environmental quality. The paper explores the integration of advanced data mining algorithms and business intelligence frameworks to analyze large datasets of atmospheric data, enabling the forecasting of air quality and environmental changes that might impact human health and safety. The methodology utilizes a combination of historical weather data, environmental measurements, and real-time inputs to identify patterns and trends associated with atmospheric degradation. By applying data mining techniques such as clustering, classification, and regression, the study identifies key factors contributing to atmospheric deterioration, including pollution levels, temperature, humidity, and other environmental variables. Business intelligence tools are used to present the results in a meaningful way, providing stakeholders with accessible reports and visualizations that facilitate decision-making. The findings highlight the potential of using predictive analytics to anticipate atmospheric changes, offering a proactive approach to environmental management and policy-making. The methodology can be applied to a variety of scenarios, including urban air quality monitoring, climate change predictions, and disaster preparedness. Moreover, the

research emphasizes the importance of real-time data integration for accurate forecasting, as well as the need for continuous updates to models as new environmental data becomes available. The proposed framework aims to assist policymakers, environmental agencies, and the public in making informed decisions that can mitigate the adverse effects of atmospheric deterioration, ensuring better management of environmental health and resources. Ultimately, the study demonstrates the effectiveness of combining data mining and business intelligence in tackling complex environmental issues and enhancing atmospheric monitoring systems.

B) Prayag Tiwari, Sachin Kumar, Denis Kalitin (2017). "Road-User Specific Analysis of Traffic Accident Using Data Mining Techniques". International Conference on Computational Intelligence, Communications, and Business Analytics. 10.1007/978-981-10-6430- 2_31.

It explores the application of data mining techniques to analyze traffic accident data with a focus on identifying the role of various road users. The study aims to develop a better understanding of traffic accidents by analyzing how different road users, such as drivers, pedestrians, and cyclists, contribute to accidents. Using data mining tools, the authors investigate patterns and trends in traffic accidents to identify key factors influencing the occurrence of these accidents. By analyzing large datasets, they examine variables such as road conditions, vehicle types, weather conditions, and human behavior in order to determine their impact on accident frequency and severity. The paper employs various data mining techniques, including classification, clustering, and association rule mining, to identify risk factors and correlations between road-user behavior and accident occurrences. The findings of the study reveal significant insights into the different categories of road users involved in accidents, as well as the most common scenarios that lead to collisions. These insights can be used to develop targeted interventions and safety measures aimed at reducing accidents. The paper also highlights the importance of utilizing data-driven approaches in traffic safety management, emphasizing how these techniques can help identify high-risk areas and optimize road safety strategies. The authors suggest that their findings could be valuable to traffic authorities, urban planners, and policymakers in designing safer road infrastructure, improving traffic regulations, and enhancing public awareness campaigns. By focusing on road-user-specific factors, this research provides a deeper understanding of traffic accident dynamics and presents actionable recommendations for reducing accident rates. The study ultimately underscores the potential of data mining in improving road safety and informing effective traffic management policies.

C) Kaur, G. and Er. Harpreet Kaur. "Prediction of the cause of accident and accident prone location on roads using data mining techniques." 2017 8th International Conference on Computing, Communication and Networking Technologies (ICCCNT) (2017): 1-7.

The paper by G. Kaur and Er. Harpreet Kaur (2017), titled "Prediction of the Cause of Accident and Accident-Prone Location on Roads Using Data Mining Techniques," investigates the application of data mining methods to predict the causes of road accidents and identify accident-prone locations. The study addresses the increasing concern of traffic accidents by utilizing data-driven techniques to analyze accident data and improve road safety. The authors employ various data mining techniques, including classification, clustering, and regression, to analyze factors such as road conditions, weather, time of day, traffic volume, and human behavior, which contribute to the occurrence of accidents. By applying these techniques to accident datasets, the paper aims to predict the likelihood

of accidents occurring in specific areas and to identify patterns that can help pinpoint accident hotspots. The study also highlights how understanding the causes of accidents and identifying high-risk locations can aid in the development of targeted interventions, such as improved signage, road redesigns, or enhanced law enforcement. The authors focus on predicting the underlying causes of accidents, such as over-speeding, distracted driving, poor road conditions, or adverse weather conditions, and suggest that their findings could be used to inform safety measures that directly address these causes. The research also emphasizes the importance of identifying accident-prone locations, enabling authorities to prioritize resources and take preventive actions in the most critical areas. Ultimately, the paper demonstrates the potential of data mining techniques to provide valuable insights into traffic accidents, which can significantly contribute to reducing accident rates and improving road safety. By identifying the key factors behind accidents and pinpointing dangerous locations, the study offers practical solutions for enhancing road infrastructure and creating a safer driving environment.

IMPLEMENTATION

Modules

Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Login, Browse Data Sets and Train & Test, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View All Antifraud Model for Internet Loan Prediction, Find Internet Loan Prediction Type Ratio, View Primary Stage Diabetic Prediction Ratio Results, Download Predicted Data Sets, View All Remote Users.

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like REGISTER AND LOGIN, PREDICT PRIMARY STAGE DIABETIC STATUS, VIEW YOUR PROFILE.

CONCLUSION

Accidents continue to be a significant issue, affecting countless lives and causing widespread disruption. While some factors contributing to road accidents are beyond control, many can be mitigated through proactive measures, such as safe driving practices and better infrastructure design. One key strategy to reduce accidents is predicting their likelihood based on past data and observations. This project successfully developed an application capable of efficiently predicting road accidents by analyzing various factors like vehicle type, driver age, weather

conditions, and road structure. By applying data mining and machine learning algorithms to a dataset from Bangalore, the model demonstrated high accuracy in predicting the risk of accidents across different locations. The successful application of this model highlights the importance of data-driven approaches in addressing the growing concern of road accidents. Moreover, the model can be further enhanced by incorporating additional constraints and variables that were not considered in the current study, leading to more comprehensive predictions. Future optimizations can help government authorities and policymakers in devising more targeted strategies for road safety. Additionally, a potential next step is to create a mobile application that assists drivers by suggesting safer routes, factoring in the risk probability for specific roads. Such a feature could integrate with popular navigation services like Google Maps and be adopted by ride-sharing companies such as Uber and Ola. This would not only improve driver safety but also enable better monitoring of accident-prone areas and streamline emergency responses. By integrating real-time risk analysis with route planning, this solution could significantly reduce the occurrence of accidents. Furthermore, the results from this study can be used to inform better road signage and safety measures on high-risk routes, contributing to improved overall road safety. In summary, the application of data mining and machine learning in predicting road accidents offers a promising avenue for reducing fatalities and enhancing safety measures on our roads.

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