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Road Accident Analysis

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Abstract
Road accidents continue to be a major concern in Tamil Nadu, impacting thousands of lives each year. This study presents an in-depth analysis of road accidents in the state for the year 2023, examining trends, contributing factors, vehicle types involved, road conditions, and district-wise data. The findings indicate a rise in both the total number of accidents and fatalities compared to the previous year. Two-wheelers account for the highest number of incidents, primarily due to failure in adhering to essential safety measures like wearing helmets. The research identifies high-risk zones (hotspots) and evaluates the influence of driver behavior, including speeding, reckless driving, and mobile phone usage while operating a vehicle. District-wise data shows that Coimbatore, Chengalpattu, and Madurai recorded the highest fatalities. Additionally, highways—both national and state—witnessed the largest share of accidents, highlighting the urgent need for improved traffic regulation and enforcement. To counter these challenges, the study reviews existing road safety measures, such as license suspensions, awareness programs, and government interventions.

Keywords: *Road Accidents, Tamil Nadu, Traffic Safety, Fatalities, Two-Wheeler Incidents, Road Management, Driver Conduct.*

1. Introduction
Road safety remains a pressing issue in Tamil Nadu, with accident rates and fatalities continuing to rise each year. Despite improvements in infrastructure and stricter enforcement of traffic regulations, factors such as overspeeding, reckless driving, and negligence still play a major role in road mishaps. Beyond mere statistics, these accidents lead to devastating human and financial consequences, affecting individuals, families, and the community at large. This research delves into the accident trends in Tamil Nadu for the year 2023, identifying the key causes behind the surge in road incidents and employing a data-driven approach to analyze accident patterns. The study examines the influence of different vehicle types, road conditions, and driver behavior in contributing to these incidents. Additionally, a district-wise analysis helps in identifying accident-prone zones, often referred to as "hotspots," where collisions occur most frequently. One of the major findings of this study is the high involvement of two-wheelers in accidents, with a significant number of fatalities linked to the failure to wear helmets. Furthermore, highways—both state and national—report the highest number of accidents, emphasizing the need for enhanced enforcement and safety regulations. The research also evaluates the impact of existing road safety measures, such as stricter traffic rule enforcement, license suspensions, and public awareness campaigns, in curbing accident rates. By providing an in-depth evaluation of road accident data, this study seeks to aid policymakers, law enforcement agencies, and the general public in implementing effective measures to enhance road safety. The ultimate objective is to foster responsible driving behavior, reduce fatalities, and ensure safer roads for all. Additionally, the study underscores the importance of technological integration in road safety measures. By leveraging artificial intelligence, surveillance systems, and real-time monitoring, authorities can proactively detect violations, analyze

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traffic patterns, and implement smart solutions to minimize risks. Such advancements, combined with public cooperation and policy enforcement, can significantly contribute to creating safer roads across Tamil Nadu. [1-3]

2. Methods of Road Accident Analysis

Data Collection: The accident data was sourced from the State Crime Records Bureau (SCRB), which maintains detailed records of road incidents. [4]

Data Preprocessing: The collected data underwent cleaning and organization to remove inconsistencies and missing values. Duplicate or incomplete records were filtered to ensure accuracy. Data was then structured for statistical and graphical analysis to highlight trends and patterns in road accidents.

Statistical Analysis & Visualization: The study applies trend analysis, geospatial mapping, and correlation studies to identify accident patterns, high-risk zones, and contributing factors.

Evaluation of Road Safety Measures: The effectiveness of traffic law enforcement, license suspensions, and public awareness campaigns is examined to determine their impact on reducing accidents and fatalities. [6]

Machine Learning-Based Accident Prediction: Machine learning analyzes historical accident data to predict high-risk zones, helping authorities implement proactive safety measures. By identifying accident patterns, optimizing resource allocation, and enhancing traffic control, this approach improves road safety policies and reduces accidents, ensuring a data-driven strategy for better traffic management in Tamil Nadu. Real-Time Traffic Monitoring and Analysis IoT sensors and AI-driven surveillance monitor traffic in real time, detecting overspeeding, violations, and congestion for immediate enforcement. Continuous data collection helps identify high-risk areas, enabling informed policy decisions and optimized traffic management. Smart monitoring solutions enhance road safety, reduce fatalities, and improve overall transportation efficiency and compliance with traffic regulation [7]

3. Figures

Figures should be provided separately from the main text. Use Arabic numerals to number all figures (e.g., Figure 1, Figure 2) according to their sequence in the text. The figure number must appear well outside the boundaries of the image itself. Multipart figures should be indicated with uppercase and bold font letters (A, B, C, etc.) without parenthesis, both on the figure itself and in the figure legends (Figure 1, 2)

Figure 2 Process of the dataset

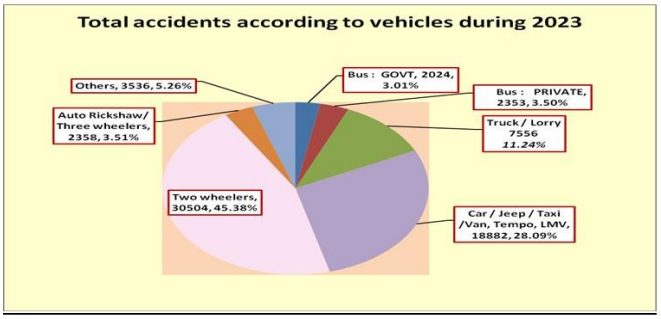

Figure 1 SEM and EDX Visualization of the Synthesized Copper Nanoparticles

4. Results and Discussion

4.1. Results

The Results should include the rationale or design of the experiments as well as the results of the experiments. Results can be presented in figures, tables, and text. The Results should include the rationale or design of the experiments as well as the results of the experiments. Results can be presented in figures, tables, and text. [8]

4.2. Conclusion

This study has highlighted critical insights into road accidents in Tamil Nadu, emphasizing the urgent need for improved road safety measures. The findings suggest that two-wheeler accidents remain the most significant contributor to fatalities, primarily due to non-compliance with helmet laws. The data-driven approach identifies high-risk areas, allowing authorities to implement targeted interventions. Improved traffic regulation, stricter law enforcement,

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and increased public awareness campaigns are necessary steps to reduce accident rates and fatalities.

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