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"AI-Driven Traffic Management and Optimised Techniques To Avoid Accidents":

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I. ABSTRACT:

The rapid growth of urbanization and vehicle traffic has made it more necessary than ever to increase road safety and lessen traffic congestion. In order to significantly reduce the incidence of accidents, this study investigates the innovative application of artificial intelligence (AI) in traffic optimization and management.Through the use of advanced machine learning algorithms and real-time data processing, our work creates a dynamic and adaptable traffic conol system. The AI-driven approach incorporates anomaly detection, predictive analytics, and intelligent decision-making to optimize traffic flow and minimize accident hotspots.

Our AI model makes use of this large data set to identify patterns, anticipate possible areas of congestion, and dynamically modify traffic signal timing for the best possible flow of traffic.Additionally, the AI-based technology forecasts possible accident-prone scenarios via predictive modeling.

The technology identifies high-risk regions proactively and takes preventive action by evaluating past accident data, traffic patterns, and environmental factors. These actions include real-time targeted traffic management,lane reallocation, and dynamic speed limit change. Comparing our results to conventional traffic control systems, we find a considerable decrease in accidents and an improvement in traffic efficiency.

The AI-based method contributes to a safer and more sustainable urban transportation environment by anticipating and preventing possible accidents in addition to responding to real-time issues. This study adds to the expanding body of information regarding the applications of artificial intelligence in transportation and emphasizes how intelligent traffic management systems can be used to build more effective and safe wurban road systems. Adoption of AI-based solutions promises to transform traffic optimization and road safety as cities continue to change.

II. INTRODUCTION:

Presentation: Urban landscapes that are always rising together with the number of vehicles on them have led to increasingly

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complicated traffic scenarios that provide serious obstacles to traffic efficiency and safety.[33].In this regard, incorporating artificial intelligence (AI) into traffic management is a novel technique that promises to both solve present issues and transform our understanding of traffic systems.[11]

This study presents a novel approach to traffic planning and management using AI. It seeks to reduce accidents by creative and aggressive tactics, ushering in a new era of traffic safety.The need for efficient and secure traffic is growing as our cities develop into busy traffic hotspots.[2]

While some traditional traffic management systems work well, they are sometimes unable to keep up with the unpredictable and dynamic nature of urban traffic. By presenting a novel AI-based framework that not only anticipates traffic issues and responds to them in real time, this study argues for a paradigm shift by proactively reducing accidents and optimizing overall traffic flow.[10]. Combining cutting-edge machine learning algorithms with the vast amounts of data produced by modern urban transportation networks is the secret to this game-changing strategy. [12].

Our research intends to provide dynamic, adaptive traffic management that continuously learns, adapts, and responds to the intricate dance of cars on city streets by utilizing artificial intelligence.This research is important for reasons beyond efficiency gains. The major objective is to usher in a new era of traffic safety by using artificial intelligence to anticipate and avert possible collisions.[16].

Our AI-based technology analyzes past accident data, current traffic patterns, and environmental factors in-depth in order to transform conventional traffic management techniques from being reactive to proactive.[2].

We shall examine the intricacies of our AI-based traffic management model in the pages that follow, covering its elements, operations, and—above all—its effect on reducing accidents. The integration of artificial intelligence and traffic management in this research is a significant step towards reimagining urban mobility in the future. It offers safer and more sustainable road systems for cities in the future, in addition to increased efficiency.[25]

III. LITERATURE SURVEY:

Signs of Drowsiness in Drivers

Three categories of indicators will be examined here:
Indicators with a defined functional form and parameter that are taken from published publications.[1]
Optimized indicators utilize the functional form of an indicator found in the literature, but they also optimize the parameters that define it.[1]

Generalized indicators: These indicators use a generalized functional form to convey their values. Moreover, as Section III-A7 shall show, the parameters in this case are likewise amenable to improvement. For instance, a generalized indicator may be reduced to an indicator from the literature given particular parameter values. A total of thirty-five different indications have been considered.[17]. Among these, the indicators with functional form and

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parameters suggested by the literature are the most optimized and generalized indicators.
With one exception, the indicators use driving behavior signals as inputs. The one exception is the model-based indicator known as the SWP (described in Section III-A8), which uses the time of day and information about past sleep patterns as inputs.. In the presentations that follow, the ith sample in a time series is denoted by xi, and n is the number of samples used to determine the output value of the indicator.[1]

Indicators Based on Time to Lane Crossing (TLC): This measure indicates how long it will take a vehicle to cross a lane limit (left or right) given its current speed and acceleration, the curvature of the road, its lateral position, and its direction, assuming the driver does not take any corrective action. Paul showed that the minimum TLC value was significantly lower during driving intervals that incorporated microsleep compared to driving periods before and after. TLC can be accurately computed using trigonometry, but the computations themselves are complex and obtaining the required data can be a challenging procedure.[1]

Steering-Wheel Reversal Rate: This driving performance statistic was first proposed by McLean and Hoffman and is widely utilized in scholarly publications. A reversal is the difference in SWA between two local SWA signal optima. The steering-wheel reversal rate is a driving performance metric that is defined as the number of reversals (r) that fall into a specific range throughout the course of a predefined driving session.

An idealized example of how to turn the steering wheel backwards is shown in Remember that real-world minima and maxima are difficult to locate due to minute variations in the signal. Various ranges have been suggested in the literature about fatigue among drivers[1]. Wierwille considered three different ranges and utilized the values to define large reversals.[22].

IV.PROPOSED METHODOLOGY:

Data Collection:

1. Traffic Data:

Sources: Traffic camera feeds, sensors, GPS devices, and traffic management systems.

Parameters: Vehicle counts, speed, density, and flow patterns.

Temporal Resolution: Real-time data for dynamic traffic conditions.

2. Accident Data:

Sources: Historical accident databases, police reports, and insurance claims.

Parameters: Accident location, time, severity, contributing factors (e.g., weather conditions), and vehicle types involved.

3. Road Infrastructure Data:

Sources: Geographic Information System (GIS) databases, municipal records.

Parameters: Road geometry, lane configurations, speed limits, and road classifications.

4. Vehicle and Driver Behavior Data:

Sources: Telematics data, connected vehicle systems.

Parameters: Driver behavior (acceleration, deceleration), vehicle types, and traffic violations.

5. Public Transportation Data:

Sources: Public transportation databases, transit agency records.

Parameters: Bus and train schedules, ridership data.

PROPOSED IMPLEMENTATION:

Libraries imported:

1. Machine Learning Frameworks:

Google created the open-source machine learning framework TensorFlow. It offers resources for creating and refining deep learning models as well as other machine learning models. [9].
PyTorch is a popular deep learning framework for creating neural networks and carrying out AI research.[31]

Pandas is a Python toolkit for handling and analyzing data in data processing and analysis. It offers preprocessing and cleaning capabilities as well as data structures for effectively managing big datasets. [19].
A core Python library for scientific computing is called NumPy. Large, multi-dimensional arrays and matrices are supported, as are mathematical operations on these arrays. [7].
OpenCV: Deep Learning for Computer Vision a well-known computer vision library with features for processing images and videos. For tasks like object detection and image recognition, it is helpful.[6].

2. Introduction to AI-Driven Driver's and Vehicle Information Recording:

Within the domain of modern traffic control, the introduction of Artificial Intelligence (AI) presents a revolutionary method for capturing detailed data about drivers and cars. Cutting-edge AI technologies are gradually replacing conventional approaches, which are characterized by drawbacks and inefficiency.[2] Through a careful documentation of driver and vehicle data, this study sets out to investigate the significant influence that utilizing AI can have on traffic control. The increasing integration of advanced technologies, such as artificial intelligence (AI), computer vision, and image identification, is paving the way for a paradigm shift in the collection and application of information aimed at improving traffic flow and road safety in general.[32].

This research attempts to provide a thorough understanding of the significance and implications of AI-driven driver and vehicle information recording in the context of modern traffic management systems through a thorough examination of the technological underpinnings and ethical considerations.[2]

3. Technologies for Recording Driver and Vehicle Information:

Understanding the complex worlds of artificial intelligence, computer vision, and picture identification is essential when exploring the technological underpinnings of AI-driven recording of driver and vehicle information. The general framework is artificial intelligence, which includes models and algorithms meant to mimic

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human cognitive functions.[35]. A branch of artificial intelligence called computer vision gives systems the capacity to comprehend visual input, making it possible to smoothly extract insightful information from picture or video data. Moreover, image recognition technologies facilitate the recognition and categorization of items within these visual inputs, which is essential for identifying particular information about drivers and cars.[2]

4. Machine Learning for Driver Behavior Analysis:

Utilize machine learning models to examine driver behavior using data that has been captured. Create algorithms that can identify trends, alterations, and possible hazards in order to enhance our understanding of drivers and their behavior when driving.[29].

5. Data Collection Methods and Sources:

This focuses on investigating various methods for obtaining data for AI-powered driver and vehicle records. This covers in-depth analyses of telematics solutions, Internet of Things (IoT) device integration, facial recognition technology, and license plate recognition systems.[36]. The discourse explores the dependability, precision, and moral implications linked to every technique, providing a thorough comprehension of the diverse methods utilized in logging driver and vehicle information to enhance traffic regulation. Using telematics devices with sensors to record data on location, speed, acceleration, and braking in real time can yield a wealth of information about driving habits. [21]

In-Vehicle Cameras: Installing cameras inside of cars to capture visual information such as road conditions, driver conduct, and facial expressions, allowing for visual analysis for behavior assessment. Onboard Sensors: Gathering information on the orientation, position, and motion of the vehicle using onboard sensors like GPS, gyroscopes, and accelerometers helps to create a comprehensive picture of driving patterns.[23].
Biometric Sensors: By utilizing biometric sensors, like as facial recognition software and heart rate monitors, physiological and facial data can be captured, enabling the evaluation of driver attentiveness and stress levels.[26].

Mobile Apps and Wearables: Creating wearables or applications that drivers can use to voluntarily provide data about their driving, behavior, and health in order to encourage user-generated content.[20]. Social Media and Online Platforms: Examining publicly accessible data from social media sites or online discussion boards to learn more about the attitudes, viewpoints, and driving habits of drivers. Government Databases and Records: For a more standardized and controlled data source, access government databases and records, such as driver's license details, registration information, and traffic infraction history.[37].

Fleet Management Systems: Monitoring and evaluating the driving habits of several cars in a fleet by utilizing fleet management systems to gather data on a bigger scale. Connected Vehicles: Investigating how contemporary cars are connected to obtain information from communication networks, in-car systems, and diagnostics

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to improve the breadth and precision of data gathered.[34].

Integration of smart sensors and Internet of Things (IoT) devices: Gather data about vehicles in real time by utilizing IoT devices and smart sensors. Connect these gadgets with AI systems to allow for ongoing tracking, logging, and updating of vehicle and driver data while they move through various traffic situations.[35].

6. Privacy and Ethical Considerations:

The focus of this exploration of privacy and ethical considerations is on the moral ramifications of using AI technologies to gather copious amounts of driver and vehicle data. It examines privacy issues brought on by the possible abuse of such data and suggests tactical steps and legal frameworks to guarantee the ethical and responsible application of AI systems. The emphasis is on protecting people's right to privacy, providing guidance on how to strike a careful balance between the protection of personal data and technology improvements.[17].

7. Telematics Technology Integration for Safety Communication:

In particular, when it comes to safety, telematics technology integration is leading the way in transforming driver and vehicle status communication. Telematics systems allow for the seamless integration of GPS, sensors, and cutting-edge communication technology to provide real-time tracking of drivers' whereabouts and vehicle conditions. This integration makes it easier to provide vital safety-related data continuously, such as unexpected stops, speeding, and other relevant driving behaviors. Because these updates are thorough and fast, drivers and fleet management can take proactive measures to solve possible safety issues, which promotes safer driving conditions. By utilizing fast and reliable information on driver and vehicle status, telematics not only improves the general safety of transportation operations but also aids in the optimization of fleet management techniques.[19]

8. Data Transmission Protocols:

The efficiency and dependability of data transmission protocols are critical to ensuring the safety of drivers and automobiles. The choice of protocols, such as WebSocket or MQTT, becomes crucial in real-time safety applications. These protocols control the data transmission between cars and centralized monitoring systems, especially when it comes to safety-related data. The reliability and effectiveness of these protocols have a direct bearing on how timely and accurate safety notifications are. The timely communication of critical information, including sudden braking, speeding, or unpredictable driving behavior, to fleet management and drivers is made possible by a well-thought-out and efficient data transmission protocol. The prompt and dependable transmission of vital safety information plays a major role in anticipatory risk reduction, promoting a more secure and adaptable transportation network.[4].

9. Driver Safety Alerts:

Maintaining the public's and drivers' safety in the ever-changing world of transportation is crucial. A novel way to proactively address possible hazards on the

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road is through AI-driven Driver Safety Alert systems. These systems use cutting-edge algorithms and sensor technologies to continuously track the behavior of drivers and the dynamics of their vehicles in real time. These AI algorithms are capable of quickly identifying safety risks by assessing characteristics including speeding, forceful braking, and irregular driving patterns. When a risk is identified, immediate alerts are set off, giving fleet managers and drivers timely notice.[27].

As a preventive step, these notifications enable drivers to rapidly modify their behavior, reduce hazards, and improve overall road safety. The combined information from these warnings goes beyond specific automobiles to provide a more comprehensive picture of traffic trends and possible risks, allowing authorities to carry out focused interventions and infrastructure upgrades.[15].

10. Communication Infrastructure for Safety:

Developing a strong communication infrastructure is essential to improving safety protocols in the transportation industry. As vehicles become more interconnected in the age of smart mobility, communication infrastructure is essential to improving real-time safety applications. High-speed network rollout, particularly 5G technology, establishes a dynamic framework that enables real-time data transfer between centralized monitoring systems and cars. This infrastructure makes it possible for vital safety-related data to be quickly exchanged, which gives AI-driven systems the ability to track and evaluate driving behavior in real time. Drivers and fleet management receive timely updates of safety alerts, collision warnings, and emergencies via this integrated network.[2]

These kinds of systems work best when communication technologies are integrated in a way that minimizes latency and delivers safety-critical data to its intended location. Furthermore, the extensive use of cutting-edge communication infrastructure enhances the overall performance of intelligent transportation systems, promoting a more responsive and safe driving environment. A strong communication foundation becomes essential in guiding the direction of autonomous cars and AI-powered safety measures, which will ultimately shape the face of transportation safety.[34].

11. GPS-based Tracking Systems:

Using GPS in cars provides a reliable way to track a person's location in real time. Vehicles regularly ascertain their exact geographic coordinates by means of GPS receivers. This device is quite helpful in an emergency since it can quickly communicate the precise location of the car to designated emergency contacts. The precise information provided by the GPS coordinates enables emergency personnel to act quickly and precisely. This technology is frequently used for many different purposes, like as fleet management and driver safety monitoring.[30].

12. 1Automatic Crash Notification (ACN) Systems:

The purpose of Automatic Crash Notification (ACN) systems is to improve vehicle safety by the automatic detection of collisions. These systems use different sensors installed within the car, like accelerometers, to detect when a collision occurs.[15].ACN systems quickly alert emergency personnel about a collision and provide them with vital information, such as the location of the car. By taking preventative measures, accident reaction times are greatly shortened, possibly saving lives. Modern cars frequently use ACN systems, which add to a thorough safety framework.[14].

13. Vehicle-to-Everything (V2X) Communication:

Vehicle-to-Everything (V2X) communication is a state-of-the-art technology that allows cars to communicate with surrounding infrastructure and with each other.[18].This dynamic system is essential in emergency situations since it broadcasts alerts to surrounding vehicles and alerts emergency services to the situation. V2X improves situational awareness and makes it possible to respond to unanticipated situations in a coordinated manner by enabling smooth communication between vehicles and their surroundings. A new era of road safety and efficiency is being ushered in by this technology, which is a major enabler of smart and connected transportation systems.[2]

14. 1Intelligent Warning Systems for Challenging Sections:

This strategy incorporates intelligent warning systems to solve unique road obstacles, like ghat parts. The AI system produces dynamic indications as cars approach or navigate in opposing directions. By acting as visual alerts, these indicators improve drivers' situational awareness and encourage safer driving behaviors. This AI-driven method greatly enhances traffic optimization by preventing accidents by tailoring warnings according to the geometry of the road and the flow of traffic.[18].

15. 1Road Condition Monitoring:

Implementing advanced sensor technologies and cameras along challenging road sections is essential for real-time monitoring of environmental conditions. These sensors can detect variables like ice formation, heavy rainfall, or reduced visibility. The collected data is then processed by intelligent systems that analyze the road conditions. If hazardous conditions are detected, the system promptly issues real-time warnings to drivers in the affected areas. This proactive approach enhances overall road safety by providing timely alerts about potential dangers, allowing drivers to adjust their behavior accordingly.[29].

16. 1Dynamic Speed Limits:

An innovative way to improve safety on difficult road stretches is to use AI algorithms to dynamically change speed restrictions. Through constant evaluation of the state of the roads, the system is able to adjust speed restrictions in real time with intelligence. For example, the AI system can automatically reduce speed restrictions to levels that promote safer driving when there is bad weather or reduced sight. By adjusting the speed dynamically, drivers can prevent accidents and ensure that they are traveling at the proper speed through difficult areas.[10].

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17. Predictive Analytics:

Finding trouble spots on a road can be done in the future by using predictive analytics and historical data. The technology forecasts possible problems along particular routes by examining historical occurrences, meteorological trends, and traffic data. By assisting in the identification of high-risk areas, predictive models allow the system to alert drivers ahead of time. This method not only increases safety but also gives drivers the ability to make well-informed decisions, such selecting different routes or using the appropriate safety measures when approaching hazardous areas.[30].

18. Vehicle-to-Infrastructure (V2I) Communication:

Enhancing driver awareness in difficult road sections can be achieved in a revolutionary way by facilitating communication between vehicles and infrastructure. Vehicles can obtain up-to-date information about road conditions, impending obstacles, and possible risks through vehicle-to-vehicle (V2I) communication. Data sharing between automobiles and infrastructure locations, such traffic management centers, is made easier by connected systems. Drivers are alerted immediately when problems are detected, which promotes a responsive and cooperative ecology that makes it safer to navigate through difficult road parts.[8].

Adaptive Headlight Systems: By dynamically modifying the headlights' direction and intensity according to the road circumstances, Adaptive Headlight Systems offer a technological leap in car safety. These systems are able to predict obstacles on the road such as curves and slopes by using sensors and real-time data. Driver visibility is improved by directing light where it is most needed, especially in difficult portions. These headlights' adaptive features make driving at night safer by lowering the risk of collisions and enhancing general road safety.[14].

In-Vehicle Haptic Feedback: These devices offer a fresh method of warning drivers through tactile cues. Haptic feedback systems are intended to function independently of visual or aural cues. Instead, they use touch-based signals or vibrations to alert drivers to potentially hazardous road portions. Haptic feedback makes ensuring that drivers receive important information without taking their eyes off the road in situations where distractions could be dangerous, such bad weather or intricate road geometry. This technology fosters a more responsive and intuitive driving experience by adding an additional layer of safety.[24].

Emergency Signaling Systems: In order to improve road safety, particularly in difficult areas, emergency signaling systems are essential. To quickly get drivers' attention, these systems trigger emergency signals, which could include dynamic road signs or flashing lights. These signaling systems aid in the prevention of accidents and guarantee prompt driver responses by giving precise and prompt signals of potential risks, such as abrupt turns or works zones. Emergency signaling systems contribute to a safer driving environment because they are visually striking and command attention.[31].Systems for Automated Emergency Braking (AEB): An essential safety element known as automated emergency braking (AEB) systems is meant to automatically apply the brakes to a vehicle in the event of an impending collision or other obstacle on the road. AEB systems offer an extra degree of security in difficult portions where prompt reactions are essential by quickly applying brakes when a possible threat is identified. Accident risk is greatly decreased by this technology, particularly in situations when human reaction time may be inadequate. Because AEB acts as a proactive barrier against crashes and unforeseen obstacles, it enhances overall road safety.[11].

V. CONCLUSION:

To sum up, the application of AI-driven traffic optimization and management is a novel strategy that has the potential to greatly reduce accidents and improve overall road safety.[3].This innovative solution can successfully handle the dynamic and complicated nature of traffic flow by integrating real-time data analysis, adaptive control systems, and sophisticated artificial intelligence algorithms.

The results of this study highlight how AI might significantly reduce the major causes of accidents, such as traffic jams, unpredictable driving patterns, and unanticipated incidents. Through the application of machine learning methodologies, predictive analytics, and automated decision-making procedures, traffic management systems are capable of anticipating possible hazards and adjusting traffic patterns to prioritize safety.[28].

Furthermore, AI is positioned as a robust and forward-thinking solution because to its capacity to continuously learn and adapt to changing environmental circumstances and traffic patterns. Policymakers and municipal planners may make well-informed decisions on infrastructure upgrades, signage placement, and law enforcement tactics by using the data-driven insights produced by AI.[13].

Even if implementing AI-driven traffic management has a lot of potential, there are several obstacles to be aware of, as well as moral issues. To guarantee the ethical application of these technologies, privacy issues, algorithmic biases, and the requirement for strong cybersecurity safeguards must be taken into consideration.

This study essentially shows that incorporating AI into traffic management can reduce accidents while also fostering the development of safer, more sustainable, and effective urban transportation networks. Realizing the full benefits of this novel strategy and influencing the future of transportation for the better will require cooperation between researchers, legislators, and industry stakeholders as we negotiate the path ahead.[2].

REFERENCES:

[1] Sandberg, David & Anund, Anna & Fors, Carina & Kecklund, Göran & Karlsson, Johan & Wahde, Mattias & Åkerstedt, Torbjörn. (2011). The Characteristics of Sleepiness During Real Driving at Night-A Study of Driving Performance, Physiology and Subjective Experience. Sleep. 34. 1317-25. 10.5665/SLEEP.1270.

[2] D. Sandberg, T. Akerstedt, A. Anund, G. Kecklund and M. Wahde, "Detecting Driver Sleepiness Using Optimized Nonlinear Combinations of Sleepiness Indicators," in *IEEE Transactions on Intelligent Transportation Systems*, vol. 12, no. 1, pp. 97-108, March 2011, doi: 10.1109/TITS.2010.2077281

[3] G. S. Aoude, V. R. Desaraju, L. H. Stephens, and J. P. How, "Driver behavior classification at intersections and validation on large naturalistic data set," IEEE Trans. Intell. Transp. Syst., vol. 13, no. 2, pp. 724–736, Jun. 2012

[4] Araghi, Sahar, Abbas Khosravi, and Douglas Creighton. "A review on computational intelligence methods for controlling traffic signal timing." *Expert systems with applications* 42, no. 3 (2015): 1538-1550.

[5] Janušová L, Čičmancová S. Improving safety of transportation by using intelligent transport systems. Procedia Engineering. 2016 Jan 1.

[6] Walraven, Erwin, Matthijs TJ Spaan, and Bram Bakker. "Traffic flow optimization: A reinforcement learning approach." *Engineering Applications of Artificial Intelligence* 52 (2016): 203-212.

[7] Pell, Andreas, Princess Nyamadzawo, and Oliver Schauer. "Intelligent transportation system for traffic and road infrastructure-related data." *International Journal of Advanced Logistics* 5, no. 1 (2016): 19-29.

[8] Tayan, Y. M. Alginahi, M. N. Kabir, and A. M. A. Binali, "Analysis of a transportation system with correlated network intersections: A case study for a central urban city with high seasonal fluctuation trends," IEEE Access, vol. 5, pp. 7619–7635, 2017.

[9] C. Bila, F. Sivrikaya, M. A. Khan, and S. Albayrak, "Vehicles of the future: A survey of research on safety issues," IEEE Trans. Intell. Transp. Syst., vol. 18, no. 5, pp. 1046–1065, May 2017.

[10] Zhu, Li & Yu, Fei & Wang, Yige & Ning, Bin & Tang, Tao. (2018). Big Data Analytics in Intelligent Transportation Systems: A Survey. IEEE Transactions on Intelligent Transportation Systems. PP. 1-16. 10.1109/TITS.2018.2815678

[11] Martensson, Henrik & Keelan, Oliver & Ahlström, Christer. (2018). Driver Sleepiness Classification Based on Physiological Data and Driving Performance From Real Road Driving. IEEE Transactions on Intelligent Transportation Systems. PP. 1-10. 10.1109/TITS.2018.2814207.

[12] Ihueze and U. O. Onwurah, "Road traffic accidents prediction modelling: An analysis of Anambra State, Nigeria," Accident Anal. Prevention, vol. 112, pp. 21–29, Mar. 2018.

[13] C. Chen, L. Liu, T. Qiu, Z. Ren, J. Hu, and F. Ti, "Driver's intention identification and risk evaluation at intersections in the Internet of vehicles," IEEE Internet Things J., vol. 5, no. 3, pp. 1575–1587, Jun. 2018.

[14] Lazarenko, Yuliia, Olga Garafonova, Svetlana Grigashkina, and Irina Verezomska. "Towards an integrated approach to improving innovation management system of mining companies." In *E3S web of conferences*, vol. 105, p. 04042. EDP Sciences, 2019.

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IJARMATE
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
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[15] Qu, Yi & Lin, Zhengkui & Li, Honglei & Zhang, Xiaonan. (2019). Feature Recognition of Urban Road Traffic Accidents Based on GA-XGBoost in the Context of Big Data. IEEE Access. PP. 1-1. 10.1109/ACCESS.2019.2952655.

[16] Nallaperuma, Dinithi, Rashmika Nawaratne, Tharindu Bandaragoda, Achini Adikari, Su Nguyen, Thimal Kempitiya, Daswin De Silva, Damminda Alahakoon, and Dakshan Pothuhera. "Online incremental machine learning platform for big data-driven smart traffic management." *IEEE Transactions on Intelligent Transportation Systems* 20, no. 12 (2019): 4679-4690.

[17] Abduljabbar, Rusul, Hussein Dia, Sohani Liyanage, and Saeed Asadi Bagloee. "Applications of artificial intelligence in transport: An overview." *Sustainability* 11, no. 1 (2019): 189.

[18] Wachter, Florian. "Emotional driving in AI-powered Cars; Driver and traffic safety. Emotion tracking and route prediction, alongside rewarding and education for good driving behaviour." (2019).

[19] Richard Gilles Engoulou, Martine Bellaïche, Samuel Pierre, Alejandro Quintero,VANET security surveys,Computer Communications,Volume 44,201

[20] Jaiswal, Akriti, A. Krishnama Raju, and Suman Deb. "Facial emotion detection using deep learning." In *2020 international conference for emerging technology (INCET)*, pp. 1-5. IEEE, 2020.

[21] F. Lindow, C. Kaiser, A. Kashevnik, A. Stocker, AI-based driving data analysis for behavior recognition in vehicle cabin, in: Proceedings of the 2020 27th Conference of Open Innovations Association (FRUCT), 2020.

[22] Iyer LS. AI enabled applications towards intelligent transportation. Transportation Engineering. 2021 Sep 1;5:100083.

[23] Fu, Yuchuan & Li, Changle & Yu, Fei & Luan, Tom Hao & zhang, yao. (2021). A Survey of Driving Safety With Sensing, Vehicular Communications, and Artificial Intelligence-Based Collision Avoidance. IEEE Transactions on Intelligent Transportation Systems. PP. 1-22. 10.1109/TITS.2021.3083927.

[24] Iyer, Lakshmi Shankar. "AI enabled applications towards intelligent transportation." *Transportation Engineering* 5 (2021): 100083.

[25] Batra N, Goyal S. DDSS: an AI powered system for driver safety. InMobile Radio Communications and 5G Networks: Proceedings of Second MRCN 2021 2022 Mar 3 (pp. 429-437). Singapore: Springer Nature Singapore.

[26] Mchergui, Abir, Tarek Moulahi, and Sherali Zeadally. "Survey on artificial intelligence (AI) techniques for vehicular ad-hoc networks (VANETs)." *Vehicular Communications* 34 (2022): 100403.

[27] Shafiei, Sajjad, Adriana-Simona Mihăiţă, Hoang Nguyen, and Chen Cai. "Integrating data-driven and simulation models to predict traffic state affected by road incidents." *Transportation letters* 14, no. 6 (2022): 629-639.

[28] Li, Linchao, Yi Lin, Bowen Du, Fan Yang, and Bin Ran. "Real-time traffic incident detection based on a hybrid deep

learning model." *Transportmetrica A: transport science* 18, no. 1 (2022): 78-98.

[29] Zhao, Dengfeng & Zhong, Yudong & Fu, Zhijun & Hou, J.-J & Zhao, Mingyuan. (2022). A Review for the Driving Behavior Recognition Methods Based on Vehicle Multisensor Information. Journal of Advanced Transportation. 2022. 1-16. 10.1155/2022/7287511.

[30] Mahardhika, Sakti Prajna, and Okkie Putriani. "A Review of Artificial Intelligence-Enabled Electric Vehicles in Traffic Congestion Management." In *ICSEDTI 2022: Proceedings of the 1st International Conference on Sustainable Engineering Development and Technological Innovation, ICSEDTI 2022, 11-13 October 2022, Tanjungpinang, Indonesia*, p. 255. European Alliance for Innovation, 2023.

[31] Chougule, Amit, Vinay Chamola, Aishwarya Sam, Fei Richard Yu, and Biplab Sikdar. "A Comprehensive review on limitations of autonomous driving and its impact on accidents and collisions." *IEEE Open Journal of Vehicular Technology* (2023).

[32] Shahin Mirbakhsh. Artificial Intelligence-Based Real-Time Traffic Management Review Article. Journal of Electrical and Electronics Engineering, 2023, 2 (4), pp.368-373. ffhal-04269098.

[33] MANSOR, Taiba SAYED, and A. B. R. I. Rayan. "Data-Driven Optimization of Urban Traffic using AI and Real-Time Analysis." In *International Conference on Pioneer and Innovative Studies*, vol. 1, pp. 507-514. 2023.

[34] Van Cuong, Nguyen, and Mohammad Tarek Aziz. "AI-Driven Vehicle Recognition for Enhanced Traffic Management: Implications and Strategies." *AI, IoT and the Fourth Industrial Revolution Review* 13, no. 7 (2023): 27-35.

[35] Abbasi, Shirin, and Amir Masoud Rahmani. "Artificial intelligence and software modeling approaches in autonomous vehicles for safety management: A systematic review." *Information* 14, no. 10 (2023): 555.

[36] Van Hieu, Doan, and Nguyen Van Khanh. "Traffic Management with AI-Powered Vehicle Recognition: Implications and Strategies." *International Journal of Sustainable Infrastructure for Cities and Societies* 8, no. 11 (2023): 1-11.

[37] Dikshit S, Atiq A, Shahid M, Dwivedi V, Thusu A. The Use of Artificial Intelligence to Optimize the Routing of Vehicles and Reduce Traffic Congestion in Urban Areas. EAI Endorsed Trans Energy Web [Internet]. 2023 Dec. 15