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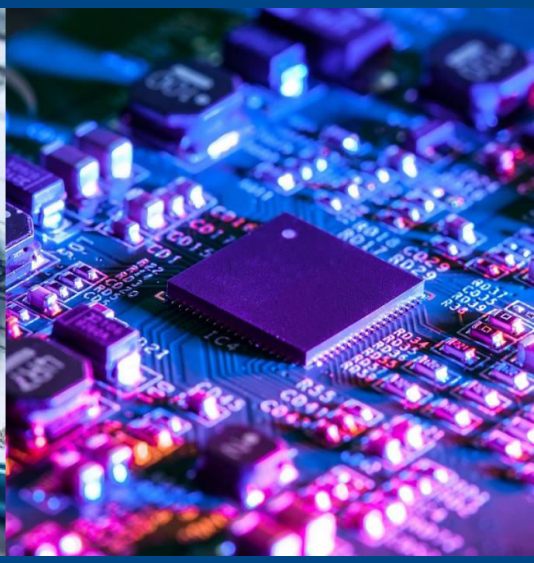

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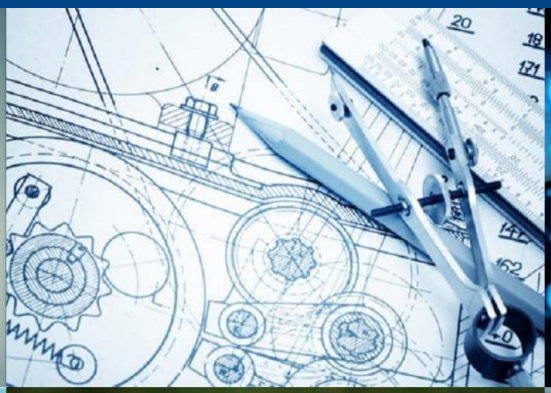

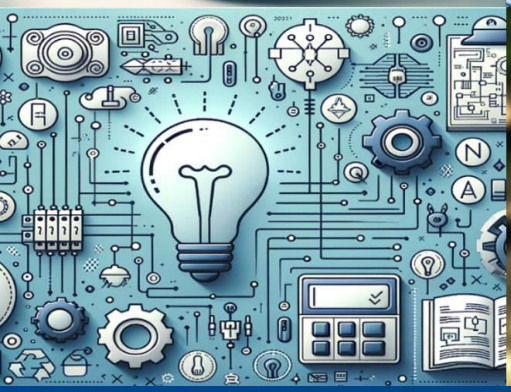

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Research & Analysis of Drowsiness Detection and Alert System from Live Video Streaming

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ABSTRACT: The rise in motor vehicles has led to an increase in traffic accidents, with drowsy driving being a major contributing factor, responsible for approximately 40% of accidents. Drowsiness, caused by fatigue or sleep deprivation, leads to reduced driver control and potential accidents.The proposed system aims to lessen the number of accidents that occur due to drivers' drowsiness and fatigue, which will in turn increase transportation safety. This is becoming a common reason for accidents in recent times. Several faces and body gestures are considered such as signs of drowsiness and fatigue in drivers, including tiredness in eyes and yawning. These features are an indication that the driver's condition is improper. EAR (Eye Aspect Ratio) computes the ratio of distances between the horizontal and vertical eye landmarks which is required for detection of drowsiness.

KEYWORDS: Machine Learning Techniques, driver drowsiness detection, Real-time monitoring, fatigue detection.

I. INTRODUCTION

Road safety is a paramount concern globally, with traffic accidents causing significant loss of life and property. Among various factors, drowsy driving is a major contributor to road accidents, often leading to severe consequences. Statistics reveal that a substantial number of accidents are attributed to driver fatigue, making it imperative to address this issue comprehensively.

The limitations of traditional methods such as self-reporting, manual monitoring, and basic alert systems highlight the need for more advanced and reliable solutions. With the advent of artificial intelligence and machine learning, there is a unique opportunity to develop sophisticated drowsiness detection systems that can predict and prevent potential accidents more effectively.

II. LITERATURE REVIEW

This paper reviews existing techniques for detecting driver drowsiness. The techniques are classified into three categories: behavioral, vehicular, and physiological. Behavioral techniques use visual cues such as eye blinking and yawning to detect drowsiness. Vehicular techniques use steering wheel movements and lane deviations to detect drowsiness. Physiological techniques use EEG signals to detect drowsiness. The paper concludes that there is no single best technique for detecting driver drowsiness, and that the best approach may be to use a combination of techniques. [1].

The research paper focuses on enhancing drivers' drowsiness detection systems using a deep learning CNN-based approach. The study aims to improve the accuracy and reliability of existing drowsiness detection systems by leveraging advanced convolutional neural networks. By analyzing facial features from live video streams, the system can detect signs of drowsiness in real-time, providing timely alerts to prevent accidents. This research contributes to road safety by addressing limitations in current detection methods and proposing a more robust solution. [2].
This research focuses on developing a facial feature-based drowsiness detection system using Multi-Scale Convolutional Neural Networks (MS-CNNs). The study aims to enhance the accuracy and reliability of drowsiness

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detection by utilizing advanced image processing techniques and deep learning models. By leveraging datasets such as YAWDD and NTHU-DDD, the research addresses challenges related to variability in lighting, facial obstructions, and camera angles, with the goal of creating a robust real-time monitoring system that can be effectively applied in real-world driving scenarios. [3]. This research focuses on developing a real-time drowsiness detection system using deep learning and computer vision techniques. Driver drowsiness is a leading cause of road accidents, necessitating effective detection systems. By analyzing facial features such as eye and mouth movements through live video streaming, the system aims to enhance road safety by providing timely alerts to drivers, thereby preventing potential accidents. [4]. Drowsiness is a significant contributor to road accidents, leading to numerous fatalities and financial losses annually. This research focuses on developing an advanced system for early detection of driver drowsiness using a hybrid machine learning approach, aiming to reduce accidents by accurately identifying signs of fatigue in real-time. [5].

III. COMPARISONS OF DIFFERENT RESEARCH PAPERS ON DROWSINESS DETECTION AND ALERT SYSTEM FROM LIVE VIDEO STREAMING.

No.	Paper Title	Author Name	Key Points	Remark
1	A Comparative Study of Driver Drowsiness Detection Techniques [1]	Dr.Prajakta Khadkikar,Miss. Rutuja Banginwar, Mr. Imon Mandal, Miss.Urmila Matade,Mr. Mayur Mote, 2023	1) Review Protocol: Define research questions, use databases (Google Scholar, Springer Link, Science Direct), filter and evaluate studies, and synthesize data. Research Questions: Identify techniques and algorithms used, visual features considered, and research gaps. 2) Search Strategy: Automated search using keywords related to "machine learning", "drowsiness detection system", and "driver" across multiple databases.	1) Eye State and Yawning Analysis (Dlib library and Python): Accuracy: 96.71% 2) Face components (Nose length, eye closing, yawning) using Aspect Ratio method and SVM: Accuracy: 89.6% 3) Steering Wheel Angle (based on vehicle parameters): Accuracy: 78.01% 4) Wearable Devices (SVM and Posterior Probabilistic model): Accuracy: 91.25% 5) Comprehensive Analysis: Reviews over 100 studies, providing a thorough understanding of driver drowsiness detection techniques.
2	Drivers' Drowsiness Detection System Enhancement Using Deep Learning: CNN-based Approach [2]	Tamal Ahmed, Oishi Jyoti, Tamanna Hossain Mou, 2023	1) Data Collection: The system uses live video streaming to capture real-time footage of the driver's face. The NTHU Drowsy Driver Detection Dataset provides training and evaluation data. 2) Feature Extraction: Facial landmarks are detected using Dlib. Key metrics such as Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) are computed to identify drowsiness. 3) Model Training: A Convolutional Neural Network (CNN) is trained on these features to classify drowsy and alert states.	1) High Accuracy: The system achieves an impressive accuracy of 97.23%, ensuring reliable detection of drowsiness(2023 Drivers_Drowsiness…). 2) Real-time Detection: The system is designed for real-time operation, providing immediate detection of drowsiness to alert drivers, thereby potentially preventing accidents. 3) Deep Learning-based Approach: The use of Convolutional Neural Networks (CNN) allows for advanced feature extraction from facial expressions (e.g., eye and mouth states), making the detection more precise and effective.
3	Facial Feature-Based Drowsiness Detection With	V.Vijaypriya, Mohan Uma, 2023	1) This research is systematized as follows: Section I provides the related works of the drowsiness	1) High Accuracy: The proposed MCNN with Flamingo Search Algorithm (FSA) achieves a high

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	Multi-Scale Convolutional Neural Network [3]		detection system and overall research methodology adopted and presented in section II. The simulation results for YAWDD and NTHUDDD datasets is obtainable in section III and the overall conclusion is presented in section IV.	accuracy of 98.38% on the YAWDD dataset and 98.26% on the NTHU-DDD dataset. 2) Effective Feature Extraction: The system uses advanced feature extraction techniques such as hybrid dual-tree complex wavelet transforms and Walsh-Hadamard transforms, optimizing performance and reducing redundant data. 3) Real-Time Detection: Processes video frames for immediate drowsiness detection. 4) Optimization with FSA: The integration of the Flamingo Search Algorithm helps optimize feature extraction, improving classification efficiency and reducing false positives/negatives.
4	Driver's real-time Drowsiness Detection using Adaptable Eye Aspect Ratio and Smart Alarm System [4]	Janki Chandiwala, Shrushti Agarwal, 2021	1) Collect real-time video streams of drivers.Preprocess video frames (resize,normalize,reduce noise). Extract facial features (EAR and MAR) using computer vision. Train CNN models to classify drowsy vs. alert states. Monitor drivers in real-time with the trained model. Trigger audio and visual alerts when drowsiness is detected.	1) Overall accuracy: The system predicted 9 out of 10 cases accurately with respect to Eye Aspect Ratio (EAR). This suggests an overall accuracy of 90%. 2) Non-intrusive approach: The system uses a camera mounted on the dashboard to detect drowsiness, without requiring any sensors attached to the driver. This makes it more practical for real-world use. 3) Adaptable Eye Aspect Ratio: Instead of using a fixed threshold, the system calculates an initial Eye Aspect Ratio (EAR) for each driver when they start driving. This allows it to work accurately for people with different eye shapes and sizes. 4) Works in low light conditions: The system is designed to function effectively even in dark/nighttime conditions, which is when drowsy driving is often a bigger risk.
5	Early Identification and Detection of Driver Drowsiness by Hybrid Machine Learning [5]	Ayman Altameem, Ankit Kumar, Ramesh Chandra Poonia, Sandeep Kumar, Abdul Khader Jilani Saudagar, 2021	1) Face Detection: Use the Viola-Jones algorithm for detecting the driver's face. Skin 2) Segmentation: Apply YCbCr color space transformation for skin detection. 3) Eye Tracking: Monitor eye movements to assess alertness. 4) Hybrid Machine Learning: Combine qualitative and quantitative	1) 83.25% overall accuracy for emotion and gesture recognition under various conditions. 2) Real-time Implementation: The proposed method enables real-time detection of driver drowsiness, which is critical for preventing accidents. 3) Adaptability to Lighting Conditions: The system performs well under different illumination

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			methods for improved detection accuracy.	conditions, including daylight, dim light, and artificial lighting, making it versatile for various driving environments.
6	A Deep-Learning Approach to Driver Drowsiness Detection [6]	Mohammed Imran Basheer Ahmed, Halah Alabdulkarem, Fatimah Alomair, Dana Aldossary, Manar Alahmari, Munira Alhumaidan, Shoog Alrassan, Atta Rahman, Mustafa Youldash and Gohar Zaman, 2021	1)Dataset: Use YAWDD and NTHU-DDD datasets for video sequences. Face 2)Localization: Apply Dlib for facial landmark detection. 3) Pre-processing: Use filtering and wavelet transforms for feature extraction. 4) Feature Extraction: Convert video data into numerical features. 5)Classification: Optimize and classify features with deep learning models.	1) High Accuracy: The CNN model achieved an accuracy of 97%, which is significantly high for drowsiness detection, ensuring reliable performance. 2) Comprehensive Evaluation Metrics: The study utilizes multiple evaluation metrics, including precision, recall, and F1-score, providing a thorough assessment of the model's performance beyond just accuracy. 3) Effective Classification: The system accurately classifies driver states into four categories: closed eyes, open eyes, yawning, and no yawning, enhancing the detection of different levels of drowsiness.

The project develops a drowsiness detection system using deep learning (CNN) to monitor eyeball movement and facial expressions (e.g., eye closure, yawning) for real-time accident prevention. The system is trained on 2900 images and considers factors like gender, age, and lighting conditions. It achieves high accuracy in detecting driver fatigue [6].

IV. CONCLUSION AND FUTURE WORK

Real time implementation of Drowsiness Detection Techniques is invariant to illumination and performs well under different lighting situations with optimum distance from the camera.Addressing the issue of drowsy driving is paramount due to its significant contribution to roadside accidents. Consequently, the development of drowsiness detection systems has been a focal point in recent years, with extensive research endeavors yielding positive outcomes.To detect the drowsiness of the driver behind the wheel in real-time based on the frames extracted from the live video stream.To improve productivity in online lectures and at work, this system can be implemented on a laptop or a PC. Furthermore, it can be used in security cabins to keep guards alert to avoid injuries, robberies, or any other mishaps.

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