IT4010 – Research Project - 2024

Topic Assessment Form

Project ID: CDAP 24_25J_197

1. Topic (12 words max)

Machine Learning based driver assistant system to reduce road accidents

2. Research group the project belongs to

Software Systems & Technologies (SST)

3. Research area the project belongs to

ICT for Development (ICTD)

4. If a continuation of a previous project:

Project ID	
Year	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

Road safety is a major concern in Sri Lanka, with a high rate of accidents and fatalities. The government has introduced initiatives to improve road safety, but more action is needed to tackle the root causes. Ke y areas of focus include developing advanced driver assistance systems (ADAS) to monitor and improve driver behavior. Challenges in Sri Lanka's driving landscape include reckless driver behavior, inadequate road sign detection, lane discipline issues, and   the potential for a virtual instructor feature in a driver assistant app. The prevalence of reckless and undisciplined driver behavior, coupled with ineffective driver education and licensing procedures, contributes to the problem. In addition, inadequate road

signs and markings, lack of awareness about traffic signs among drivers, and inconsistent

enforcement of traffic laws by the police further worsen the situation.

Maintaining proper lane discipline is a significant challenge in Sri Lanka's driving environment. Drivers often disregard lane markings, drive in the wrong lanes, and cut across lanes without considering other vehicles. This problem is worsened by parked v   ehicles blocking the left/slow lane, leading to unsafe lane weaving. Additionally, unclear lane markings and signage

make it difficult to stay within designated lanes, increasing the risk of accidents. To improve driver

education, a potential solution is a virtual instructor feature in the driver assistant app, providing

real-time feedback and guidance. Incorporating advanced features like lane departure warning, blind spot detection, and collision avoidance can assist drivers in navigating roads more safel y.

This research project emphasizes using driver assistant systems to reduce accidents and enhance road safety. Understanding driver interaction with the system and integrating advanced technologies such as artificial intelligence and machine learning algorit   hms are crucial research areas to improve the performance, safety, and user experience of driver assistant systems. This research aims to contribute to the development of more intelligent and reliable technologies for future vehicles, ultimately helping to   reduce road accidents and improve the driving experience for individuals   by addressing these key issues through a comprehensive approach, the driver assistant app can play a crucial role in enhancing road safety and promoting responsible driving practices in Sri Lanka.

References:

1.   World Bank, "Delivering Road Safety in Sri Lanka: Leadership Priorities and Initiatives to 2030," [Online]. Available:

https://documents.worldbank.org/curated/en/976361582088610795/pdf/Deliverin g-Road-Safet y-in-Sri-Lanka-Leadership-Priorities-and-Initiatives-to-2030.pdf. [Accessed: 17-Jun-2024].

2.   Numbers.lk, "Prioritizing Road Safety: A Global Challenge and Sri Lanka's Perspective," [Online]. Available: https://numbers.lk/news/prioritizing-road-safety-a-global-challenge-and-srilank a-s-perspective. [Accessed: 17-Jun-2024].

3.   N. D. Sinclair, "Three Ways to Improve Road Safety in Sri Lanka," Asian Development Blog, 15Jan-2024. [Online]. Available: https://blogs.adb.org/blog/three-ways-improve-road-safety-sri-

lanka. [Accessed: 17-Jun-2024].

6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The proposed solution is a comprehensive driver assistant system (DAS) aimed at enhancing road safety in   Sri Lanka by addressing key challenges such as reckless driving, inadequate road sign detection, and poor lane discipline. The system leverages advanced driver assistance technologies integrated into a   n application, which functions as a virtual instructor providing real   -time feedback and guidance.

Key features of the Driver Assistant System include,

Virtual Instructor Provides immediate feedback and guidance to drivers, promoting responsible driving practices and improving driver education.

Driver Identification is implementing a feature to identify different drivers who drive the same vehicle and assists them to adjust the vehicle.

Parking Assistance can utilize sensors and data analytics that can accurately identify available parking spots in various environments.

Enhanced Road Sign Detection detects and interprets road signs accurately, even in any conditions where signs are poorly visible.

Blind Spot Detection integrates object detection and distance measurement, into a single system provides a holistic solution for blind spot detection.
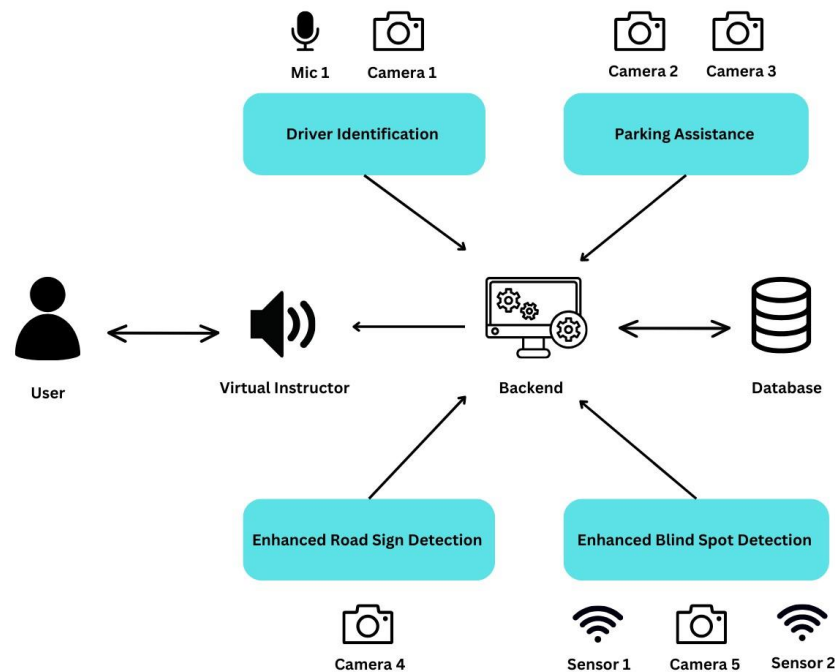
7. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

> The development of a comprehensive driver assistant system (DAS) for improving road safety in Sri Lanka necessitates specialized domain expertise across multiple fields. In artificial intelligence and machine learning (AI/ML), expertise in real-time data processing, predictive analytics, and adaptive learning is essential. This includes understanding neural networks, computer vision, and natural language processing to enable functionalities like lane detection, collision avoidance, and road sign recognition, requiring large datasets of driving behaviors, road conditions, and traffic patterns specific to Sri Lanka. Automotive engineering expertise is crucial, particularly knowledge of vehicle dynamics, sensor integration, and advanced driverassistance systems (ADAS), alongside familiarity with automotive safety standards and regulations to ensure compliance, necessitating data from vehicular sensors and telematics for real-time system response and calibration. Human factors and ergonomics expertise is needed to understand driver behavior, cognitive load, and human-machine interaction, ensuring the DAS provides non-intrusive yet effective feedback, supported by behavioral data on driver responses to different stimuli and feedback mechanisms. Traffic engineering and road safety expertise involve knowledge of traffic flow, road design, and safety measures, with insights into specific traffic challenges and accident hotspots in Sri Lanka, requiring traffic accident reports, road condition surveys, and enforcement records to identify risk areas and develop targeted interventions. Regulatory and legal expertise is essential to understand local traffic laws, insurance regulations, and data privacy laws, ensuring the DAS complies with legal requirements and protects user data, necessitating legal texts and case studies on road safety regulations and compliance standards. By integrating expertise from these domains and leveraging comprehensive datasets, the DAS can be tailored to address the unique road safety challenges in Sri Lanka, ultimately reducing accidents and enhancing the overall driving experience.

8. Objectives and Novelty

The main objective of our driver assistant system is to enhance the safety and confidence of novice drivers by providing real-time, intelligent assistance. Using advanced smartphone capabilities, the system detects and interprets road signs, lanes, and traffic lights, offering immediate feedback and alerts. This ensures that drivers can navigate various road scenarios safely and effectively, helping to reduce the risk of accidents and improve overall driving performance without the need for external devices.			
Member Name	Sub Objective	Tasks	Novelty

| Somarathne R.M.B.C. | Driver Monitoring and Driver identification using biometrics for enhance the security | **Driver face Identification**
The system maps facial landmarks and compares the captured data to stored profiles.

Driver Monitoring
System detects the behavior of the driver and warns him to pay attention to the road immediately

Security Messaging System
When an unauthorized driver is detected, the system can immediately send a security alert to the owner's smartphone or connected device. | **Multimodal Biometric Authentication**
The integration of voice and face recognition for a robust and secure driver identification system. |

Wijerathne G.A.R.	Road signs and road condition detection for enhancing safe driving	**Sign Recognition** The system must recognize the type of road sign detected, such as stop signs, speed limit signs, or warning signs. **Narrate Road Signs to Driver** This enhances the driver's understanding of road signs through audio narration, even if they are not familiar with the signs. **Warn Driver About Speed Limits and Bends** This involves creating a system that alerts the driver about upcoming speed limits and road bends to enhance safety.	**Comprehensive Road Awareness** Combining road sign detection, climate condition recognition, and bend detection offers a holistic approach to driver assistance, enhancing safety and situational awareness.

Neelawala P.K.N.G.K.B.	Parking assistance for increase parking accuracy	**Parking Spot detection** Focuses on creating a system that can accurately identify available parking spots in various environments such as parking lots, streets, and garages. **Correct Parking line Alignment** Ensure the vehicle is parked correctly within the parking lines, providing feedback to the driver for adjustments if need.	**Comprehensive Parking Assistance** The combination of parking spot detection, object detection, and parking line alignment into a single system provides a holistic parking assistance solution.

Nayanathara R.M.C.	Real time comprehensive blind spot identification with distance measurement	**Real-Time Blind Spot Monitoring** System to detect objects around the vehicle to prevent collisions. **Distance Measurement** Focuses on accurately measuring the distance to objects around the vehicle, providing the driver with crucial information for safe driving. **Assist Overtaking Maneuvers** Aims to provide the driver with assistance during overtaking maneuvers, ensuring safety and reducing the risk of collisions. **Alert Driver About Upcoming Traffic Jams** Focuses on alerting the driver about upcoming traffic jams, allowing for better route planning and avoiding delays.	**Comprehensive Blind Spot Detection** Integrating object detection and distance measurement, into a single system provides a holistic solution for blind spot detection.

9. Supervisor checklist

   a) Does the chosen research topic possess a comprehensive scope suitable for a final-year project?

Yes	✓	No	

   b) Does the proposed topic exhibit novelty?

Yes	✓	No	

   c) Do you believe they have the capability to successfully execute the proposed project?

Yes	✓	No	

   d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes	✓	No	

   e) Supervisor's Evaluation and Recommendation for the Research topic:

   Recommended

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Mr.	Ravi	Supunya	*Ravi*
Co-Supervisor	Ms.	Dulani	Maheshika	*Maheshika*
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

This part is to be filled by the Topic Screening Panel members.

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

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*Important:

1. According to the comments given by the panel, make the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.

2. If the project topic is rejected, identify a new topic, and follow the same procedure until the topic is approved by the assessment panel.