Problem Statement 1 - Enhanced Driver Alertness System

Context:

Following the successful first round, we're striving to elevate road safety even further. We've recognized that driver drowsiness and unease continue to be critical issues leading to accidents. New technology offers a path to heightened solutions.

Problem Statement:

In this advanced round, we call upon the first round winners and other top participants to develop an even more advanced technology that can swiftly and precisely detect driver drowsiness or unease. The aim remains the creation of a system that can be integrated into vehicles for a substantial enhancement in road safety.

Dataset:

You can use the dataset from the first round or any other relevant data you may obtain to train and validate your improved system.

Requirements:

- **Highly Accurate Detection:** Construct a system that excels in swiftly recognizing signs of driver drowsiness or unease, minimizing false alarms.
- **Real-Time Functionality:** Ensure that your system operates almost instantaneously. It should be designed to work seamlessly within a car's hardware.
- **Advanced Techniques:** Employ cutting-edge technology from the realm of Machine Learning and Deep Learning. Clearly explain your methodology choices.
- **Thorough Evaluation:** Demonstrate your system's performance through rigorous quantitative analysis, highlighting metrics such as precision, recall, and false positives across diverse driving conditions and lighting situations.
- **Computational Efficiency:** Optimize your system to work efficiently in real-world, resource-constrained environments, such as vehicles.
- **Realistic Scenario Testing:** Validate the system's performance in real-world situations, including challenging conditions like low lighting and variable driver characteristics.

- **Future-Proof Design:** Ensure that your system is adaptable and can be updated without disrupting existing vehicle systems.

Deliverables:

Participants should submit:

- A video demonstrating the real-time functionality of the advanced system, showcasing its accuracy.
- A comprehensive document or presentation explaining the system's architecture, preprocessing techniques, hyperparameter choices, and performance metrics.
- Provide a code repository for public review and evaluation, such as on GitHub.

Final Notes:

The primary objective of this advanced challenge remains the enhancement of driver alertness systems, ultimately contributing to road safety. The focus remains on preventing accidents due to drowsy or uneasy drivers.

Problem Statement 2 - Advanced Autonomous Vehicle Technology

Context:

The world is progressing toward self-driving cars to make transportation more convenient and secure. Advanced computer systems and cameras play a critical role in enabling these vehicles to navigate and make rapid decisions.

Problem Statement:

In this advanced challenge, we invite the winners from the first round and other top participants to develop an even more intelligent system for self-driving cars. The goal is to create a system that excels in understanding the road and making swift decisions to ensure passenger safety.

Dataset:

You may continue using the data from the first round or acquire new data resembling real-world driving scenarios.

Requirements:

- **Rapid Environmental Understanding:** Construct a system that can swiftly analyze the road environment in real-time.

- **Object Detection and Recognition:** Develop advanced capabilities for identifying and categorizing objects on the road, including vehicles, pedestrians, road signs, and obstacles.

- **Safe Decision-Making:** Create algorithms for autonomous vehicles to make intelligent decisions, such as changing lanes, adjusting speed, and avoiding obstacles.

- **Human Interaction:** Design features that enable the vehicle to understand and interact with human drivers and pedestrians.

- **Sensor Fusion:** Integrate data from various sensors, including cameras, LiDAR, and radar, to enhance perception and decision-making.

- **Safety and Redundancy:** Prioritize safety by incorporating multiple layers of redundancy and safety measures.

Deliverables:

Participants should provide:

- A video demonstrating the real-time operation of the advanced system within a self-driving car.
- A detailed document or presentation explaining the system's architecture, machine learning models, and algorithms, alongside performance metrics and safety measures.
- Host the codebase for public review and evaluation, such as on GitHub.

Final Notes:

This advanced challenge focuses on the future of self-driving transportation. The objective is to make driving safer and more convenient through advanced technology. Your contributions in this challenge can play a crucial role in shaping the future of transportation.