Google Cloud

H2S HACK2SKILL

GenAI Hackathon

APAC Edition

Team Name :Synergise

Problem Statement :Advanced Vehicle Safety System with Real-time Hazard Detection and Intervention

Brief about the Idea:The project aims to revolutionize vehicle safety through the development of an advanced system powered by cutting-edge AI technologies. By integrating state-of-the-art object detection algorithms, including YOLO and CenterNet, the system can accurately identify vehicles, pedestrians, and other objects in the vehicle's vicinity in real-time. Additionally, contextual analysis factors in variables such as road conditions, weather, and traffic density to provide a more comprehensive assessment of potential hazards. Through predictive analytics, the system anticipates dangers based on historical data and patterns, enabling proactive risk mitigation strategies. Drivers receive immediate feedback and interventions via adaptive user interfaces, which prioritize critical information and adapt to individual preferences and situational context. Furthermore, seamless integration with fleet management systems empowers fleet operators with real-time insights to optimize operations and enhance safety across their fleets. Ultimately, the project aims to significantly improve safety for truck drivers and other road users, enhance operational efficiency, and contribute to the advancement of AI-driven safety systems in the transportation industry.

Opportunity :The opportunity lies in the development of an advanced vehicle safety system that utilizes cutting-edge AI technologies to address key challenges in road safety. What sets this project apart from existing ideas is its holistic approach to hazard detection and risk mitigation, combined with its focus on real-time feedback and intervention.

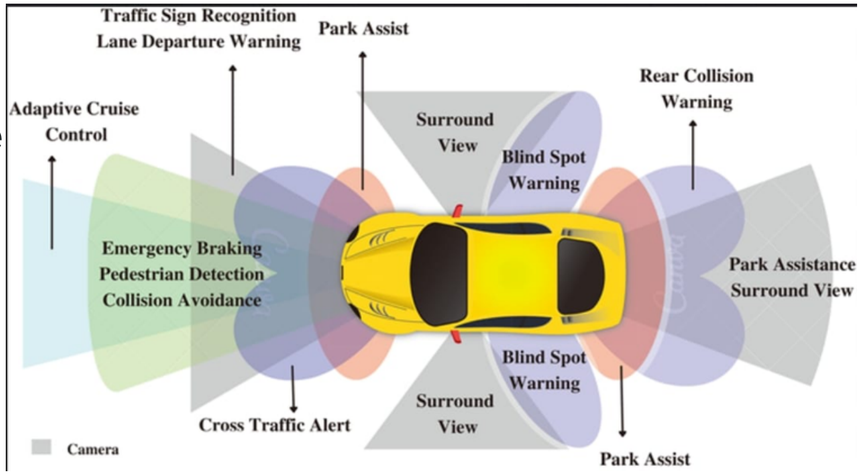
Unlike traditional safety systems that rely solely on basic object detection, this project incorporates advanced algorithms such as YOLO and CenterNet, enabling more accurate and efficient identification of vehicles, pedestrians, and other objects in the truck's vicinity. Moreover, the system takes into account contextual factors such as road conditions, weather, and traffic density, providing a more nuanced understanding of potential hazards.

By leveraging predictive analytics, the system can anticipate dangers based on historical data and patterns, allowing for proactive risk mitigation strategies. Drivers receive immediate feedback and interventions through adaptive user interfaces, which prioritize critical information and adapt to individual preferences and situational context. This proactive approach to safety sets it apart from reactive systems that only provide warnings after an incident has occurred.

Overall, this project represents a significant advancement in vehicle safety technology, offering a comprehensive solution that goes beyond traditional approaches. By combining advanced AI algorithms with real-time feedback and intervention capabilities, it has the potential to greatly reduce the risk of accidents and fatalities on the road, ultimately enhancing safety for drivers and other road users.

Some features that our model has:

Predictive Collision Warning: Provides early warnings to the driver about potential collision risks based on the analysis of nearby objects' speed, trajectory, and proximity, allowing the driver to take evasive action or apply brakes in advance



Lane Departure Warning and Prevention: Monitors the vehicle's position within its lane and alerts the driver if there is an unintentional drift, while also offering corrective measures such as steering assistance or gentle braking to prevent lane departure.

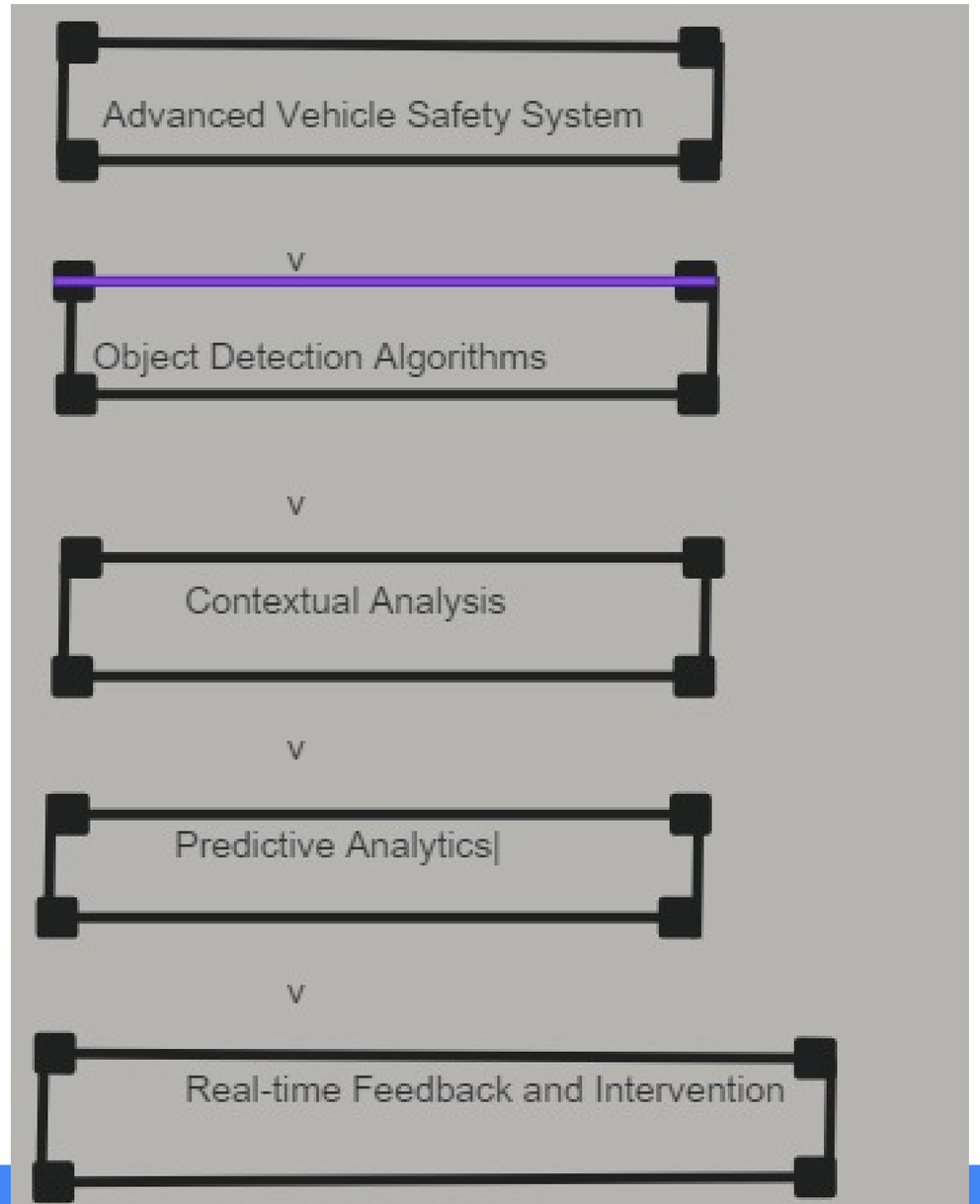
Blind Spot Detection and Intervention: Alerts the driver to the presence of vehicles in the blind spots, typically with visual or audible warnings, and may also provide corrective actions such as steering wheel vibration or lane assistance to avoid potential collisions during lane changes.

Traffic Sign Recognition: Uses image processing techniques to detect and interpret traffic signs, including speed limits, stop signs, yield signs, and traffic signals, displaying relevant information to the driver on the dashboard or heads-up display.

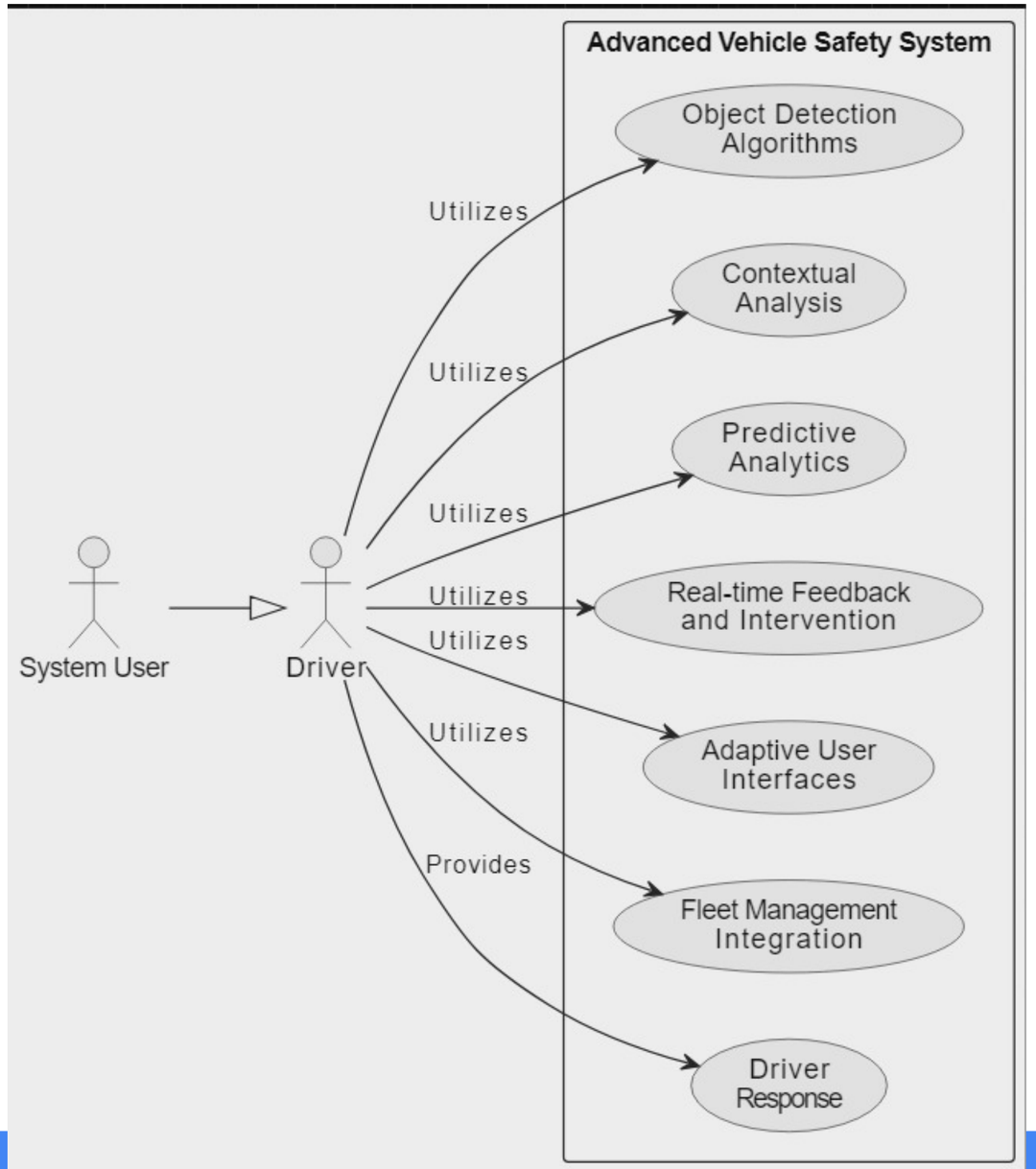
Adaptive Cruise Control (ACC): Maintains a safe following distance from the vehicle ahead by automatically adjusting the vehicle's speed, slowing down or accelerating as needed, while still allowing the driver to maintain control and override if necessary.

Cross-Traffic Alert: Warns the driver of approaching vehicles or pedestrians when backing out of parking spaces or driveways, reducing the risk of collisions in busy parking lots or residential areas.

Process Flow Diagram



Use Case Diagram



Technology used: The advanced vehicle safety system relies on a combination of cutting-edge technologies, with specific utilization of Google GenAI tools to optimize its capabilities. Google Cloud Vision API serves as the backbone for image analysis, enabling precise detection and recognition of vehicles, pedestrians, and other objects surrounding the truck. Additionally, Google AutoML Vision facilitates the creation of custom object detection models, tailored to the unique requirements of truck safety, by training on specialized datasets to enhance accuracy and reliability in hazard identification. Operating within the Google AI Platform, the system efficiently manages model development, training, and deployment processes, ensuring scalability and seamless integration into production environments. Leveraging TensorFlow Object Detection API, the system implements sophisticated algorithms for real-time object detection, further enhancing its ability to track potential hazards on the road. Moreover, Google Cloud Video Intelligence API complements these capabilities by analyzing video content to detect and monitor objects over time, providing invaluable insights for proactive risk mitigation strategies. Through the strategic utilization of these Google GenAI tools, the advanced vehicle safety system achieves exceptional levels of accuracy, scalability, and efficiency in detecting and mitigating hazards, ultimately enhancing safety for truck drivers and other road users.

1. Estimated cost of/after implementing the solution : Software Development: This would involve building the software components necessary for collecting GPS data, processing it, and determining the proximity to traffic signals. As a beginner, you might consider using open-source tools and libraries to minimize costs. Estimate: $5,000 - $10,000.
2. Cloud Services: You'll likely need to use cloud services for hosting and processing the software components. Depending on the scale of your project, this could range from basic usage to more advanced features. Estimate: $100 - $500 per month.
3. Data Acquisition: Accessing real-time traffic signal data may incur costs, depending on the source and availability of the data. Some municipalities offer open access to traffic signal data, while others may require purchasing access or obtaining it through partnerships. Estimate: $0 - $5,000 (one-time or annual fee).
4. Integration and Testing: Integrating GPS data with traffic signal information and testing the system for accuracy and reliability will require time and resources. This could include developer time for integration and testing, as well as any additional software or tools needed. Estimate: $2,000 - $5,000.
5. Miscellaneous Costs: This could include expenses such as developer tools, licenses for software libraries, and potential consulting fees for specialized expertise. Estimate: $500 - $1,000.

Total Estimated Cost: $7,600 - $21,500

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