ADAS & AI/ML exercise

Task

I*n ADAS, it is important that the vehicle gets continuous data of its surroundings accurately and responds according to it. To achieve this, camera and radar are used. The ability to fuse data from multiple sensors enhances the system's accuracy and robustness, providing better decision-making for tasks like object detection, collision avoidance, and navigation assist.*

***T*his assignment aims to test your ability to work with multiple sensor inputs, perform data fusion, and apply AI/machine learning for obstacle detection in the context of ADAS. Output can be generated either using real life vehicle reference data or a scaled down experiment.**

Steps involved

1. Understanding the ADAS architecture (10%)
    - By integrating various sensors and Machine Learning models, generate a system-level flowchart for ADAS operation.
2. Data Preprocessing and correlation (20%)
    - Download and use open source dataset that includes data from different vehicle sensors such as Camera/ Radar/ etc.
    - Pre-process the images using transfer learning through a suitable custom model to identify various objects (human, vehicle, bike, dog, pedestrians, etc) on the road to generate object vectors for each of the camera images (30 camera frames per second).
    - Pre-process Radar data to deterministically generate the field of view and road infrastructure. Also generate the list of objects, relative speed, and distance of each object from the vehicle.
    - Ensure data reliability and optimization
3. Object detection and Placement (25%)
    - Correlate the object data of Camera v/s Lidar to train the AI models
    - Perform contour based on their appearance.
    - Identify potential obstructions dynamically in the drive path using custom AI/deep learning models.
4. Decision Making (25%)
    - To avoid collisions in least probability, visual and alarm indications should be triggered.
    - For confirmed collision probable scenarios, trigger corrective mechanisms like automated braking, turn assist, lane change avoidance, ACC, etc.
5. Improvements to increase efficiency (20%)
    - State at least 3 improvement points to ensure better efficiency in prediction.

Submission required Document your approach, including:

1. How you processed the data.
2. The sensor fusion techniques you applied.
3. How you integrated the camera and LIDAR data.
4. The collision avoidance algorithm and its results.

5. Provide visualizations of data processing, object detection, and sensor fusion results.
6. Provide links to source of data, models used, other reference, etc.