1. Project Name:

Real-Time Object Detection for Autonomous Vehicles

2. Team Members:

- **Member 1:** Eslam Mohamed Abdelhamid
- **Member 2:** Ahmed Reda
- **Member 3:** Mohamed Ahmed ELkazaz
- **Member 4:** Mohamed saeed Arafa

3. Project Idea and General Description:

The Real-Time Object Detection for Autonomous Vehicles project focuses on building a machine learning model that can detect and classify objects in the environment, such as pedestrians, vehicles, traffic signs, and obstacles. The model will be deployed in autonomous vehicle systems to enhance safety and decision-making in real-time driving scenarios. The project aims to address challenges such as detecting objects in different lighting conditions, road types, and varying environmental factors.

4. Technologies to be Used in the Project:

- **YOLO (You Only Look Once):** Known for fast and efficient object detection, suitable for real-time systems.
- **SSD (Single Shot Multibox Detector):** Another real-time detection model optimized for speed and accuracy.
- **Faster R-CNN:** Offers high accuracy but may be slower than YOLO and SSD.
- **TensorFlow Serving or ONNX:** For deploying the model in an optimized inference pipeline.

5. Work Plan and Roles of Each Team Member:

- **Member 1:** Responsible for data collection and exploration.
- **Member 2:** Responsible for data preprocessing and augmentation.
- **Member 3:** Responsible for object detection model development and training.
- **Member 4:** Responsible for model deployment and real-time testing.

6. Functional Requirements:

- Collect a dataset containing images with labeled bounding boxes for objects.
- Develop an object detection model capable of real-time predictions.
- Evaluate the model's performance using metrics such as mean Average Precision (mAP) and Intersection over Union (IoU).
- Deploy the model in an autonomous vehicle system.

7. Non-Functional Requirements:

- The model must perform well under various lighting conditions.
- The system should achieve real-time performance (frames per second).
- The system must be reliable and safe to ensure the safety of passengers and pedestrians.
- Continuous monitoring of the model is required to detect any performance degradation.