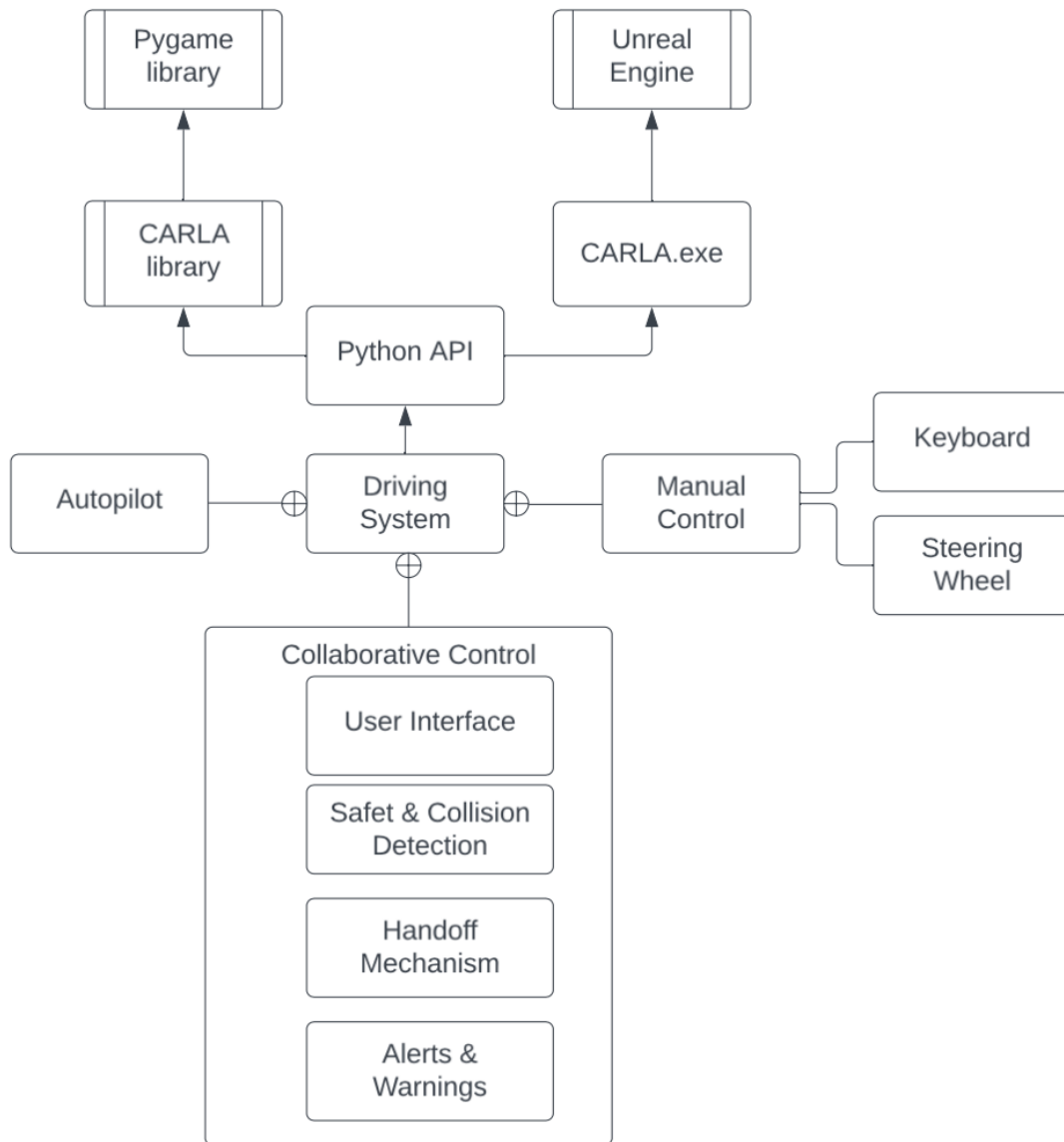


# COLLABORATIVE CONTROL OF AUTONOMOUS CARS PROJECT DESIGN

The primary goal of this design is to maintain safety while providing a user-friendly interface for the driver to transition between manual and autonomous control seamlessly. The system should prioritize safety through robust monitoring, alerts, and a reliable handoff mechanism. Extensive testing is crucial to validate the design's effectiveness within the CARLA simulator.

## Design Diagram



## **Design and Interaction**

### **1. Engaging Autopilot**

- a. The driver initiates autopilot mode through the user interface via pressing a key on the keyboard or button on the steering wheel.

### **2. Autonomous Operation:**

- a. Once in autopilot mode, the autonomous system takes control of the vehicle.
- b. It leverages data from various sensors (cameras, lidar, radar, etc.) to perceive the environment, identify obstacles, and plan the optimal path.

### **3. Handoff Scenario:**

- a. In certain scenarios, such as complex traffic situations or when the vehicle encounters road work, the system may decide that the driver needs to take over control.
- b. This decision is made based on real-time data from the sensors, which may identify scenarios where human intervention is safer or more appropriate.

### **4. Handoff Mechanism:**

- a. When the system determines that a handoff is necessary, it sends a visual alert to the driver.
- b. The alert informs the driver that they need to retake control of the vehicle.
- c. The user interface may also change to reflect the handoff request, making it easy for the driver to disengage autopilot and take control. e.g pop up a window/symbol on the dashboard alerting the user to take action.

### **5. Handing Control Back to the Driver:**

- a. The driver acknowledges the alert and regains control by taking over the steering, acceleration, and braking.
- b. In most scenarios, control is gradually transferred to the driver, allowing them to make a smooth transition.
- c. Driver can regain control of the vehicle willingly by turning off autopilot.

### **6. Alerts and Warnings:**

- a. If the driver does not respond to the handoff request or if their attention remains insufficient, the system can escalate the alerts.
- b. In extreme cases where the driver remains unresponsive, the system may autonomously bring the vehicle to a safe stop.

