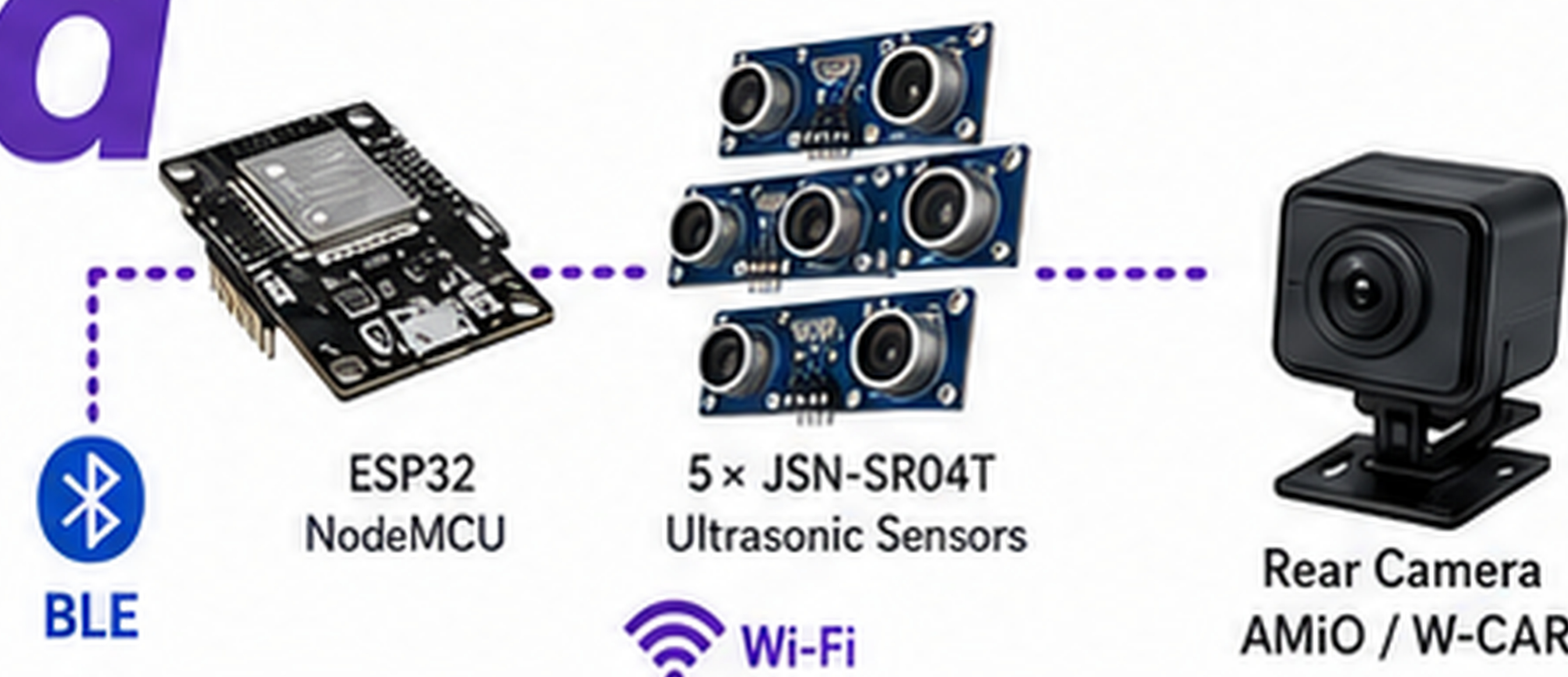


DriveGuard

Low-cost retrofit system for driver monitoring and parking assistance

Group 16 • ElectroDay



A modular solution that combines AI on smartphone, ultrasonic sensors and Wi-Fi rear camera to enhance safety in vehicles without native ADAS.

1 Problem

- Many older vehicles lack advanced safety systems.
- Driver fatigue, distraction and continuous parking maneuvers are major causes of risk.
- OEM solutions are expensive and hard to retrofit to existing vehicles.



2 Solution

- Android smartphone as the central processing and interface unit.
- ESP32 NodeMCU + 5 × JSN-SR04T sensors to measure distance.
- Wi-Fi rear camera AMiO / W-CAR to support parking.
- BLE communication for sensors and Wi-Fi for video streaming.

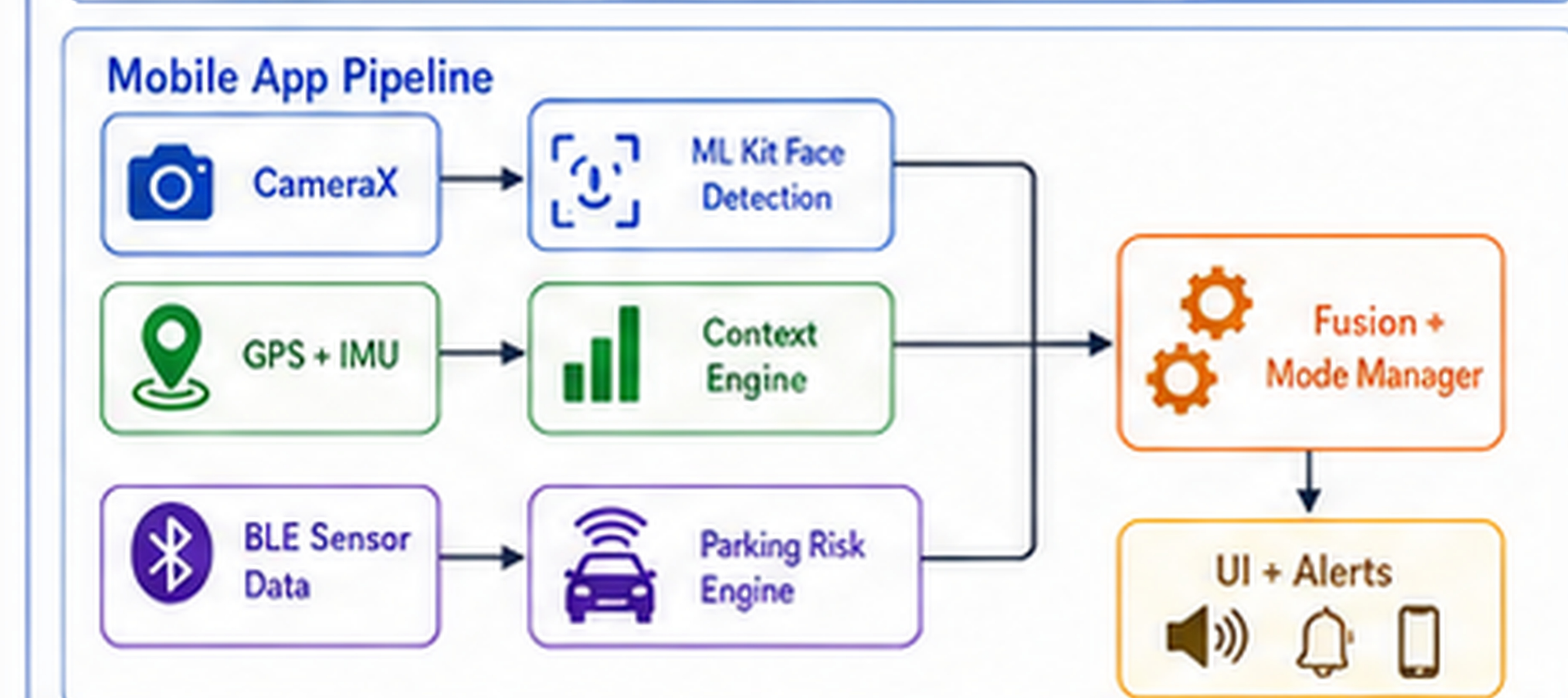
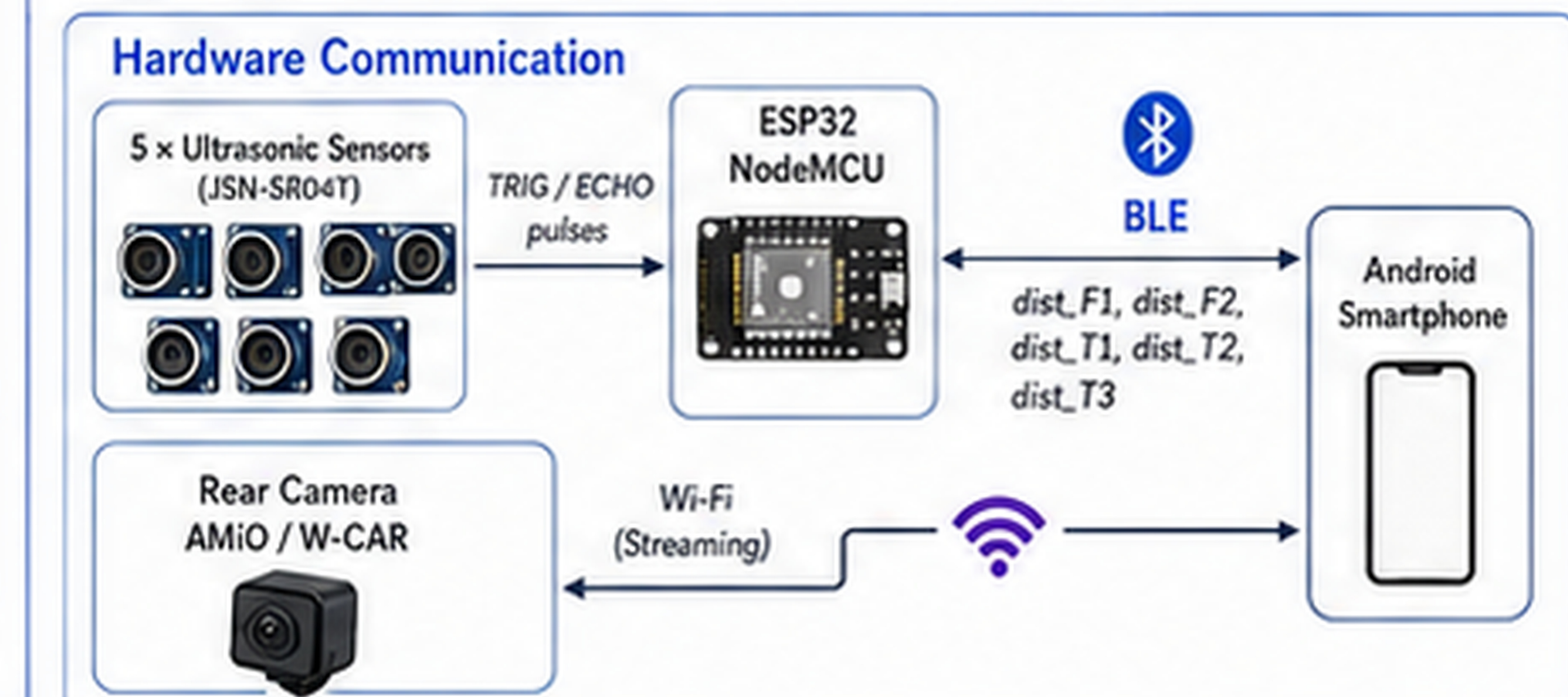


3 Target Users

- Drivers of vehicles without native ADAS.
- Driving schools.
- Fleet managers seeking a low-cost retrofit solution.



4 System Architecture

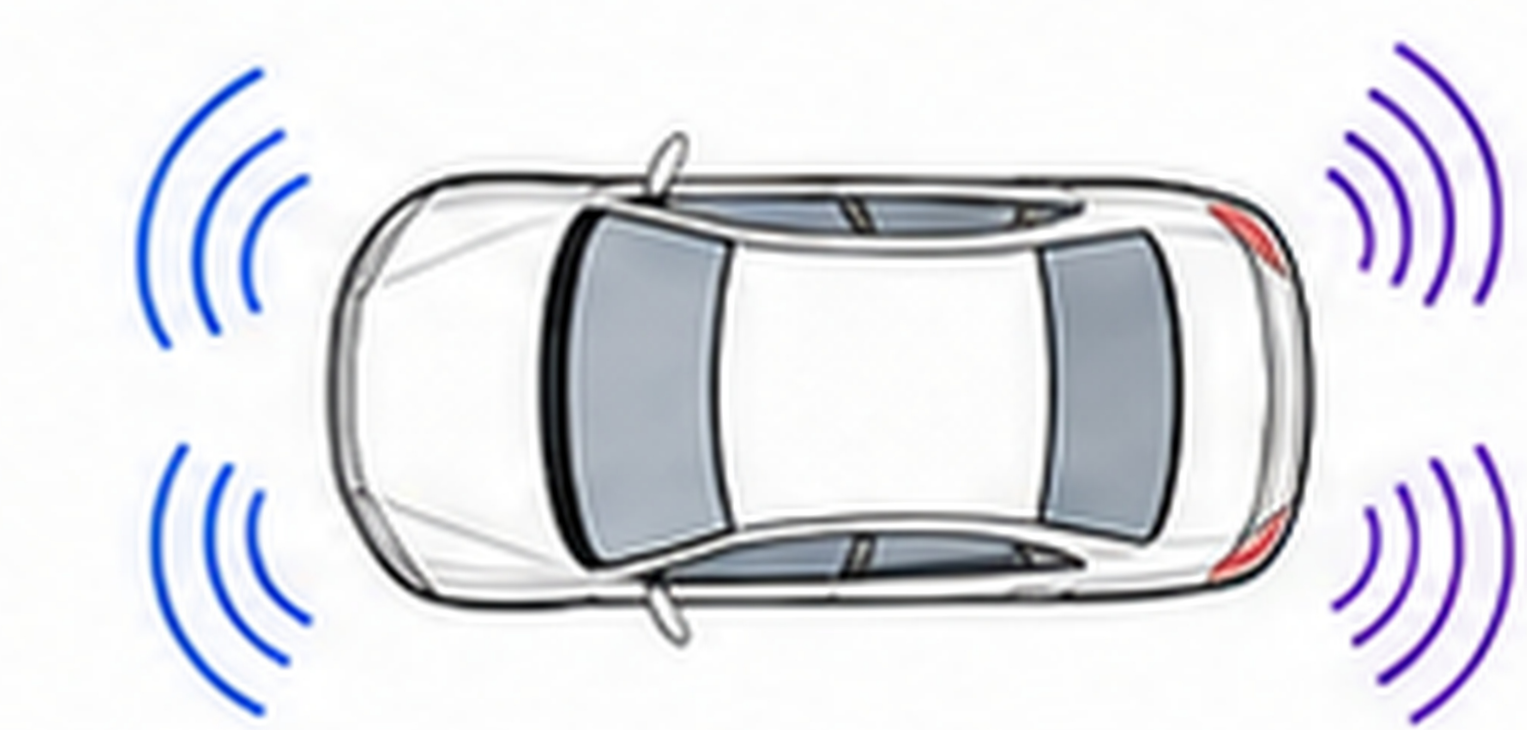


5 Driver Monitoring

- CameraX + Google ML Kit Face Detection runs locally on the smartphone.
- **Prolonged eye closure:** detected by prolonged eye shut.
- **Distraction:** calculated by head deviation relative to the road centerline.
- **Posture:** evaluated using pitch, roll and head position relative to the seat.
- **Privacy:** on-device processing, no cloud required.

6 Parking Assistance

- Five ultrasonic sensors monitor obstacles in front and behind the vehicle.
- The app uses measured distance to estimate risk level.
- Wi-Fi rear camera complements the driver's perception.



| Safe | Low | Medium | High | Critical |
|----------|-----------|----------|----------|----------|
| > 120 cm | 81–120 cm | 46–80 cm | 26–45 cm | ≤ 25 cm |

7 Prototype Results

- Android app developed in Kotlin.
- BLE data received in real time from ESP32.
- Automatic switching between driving and parking modes.
- Pose estimation calibration reduces false alerts.
- Visual, audible and vibration alerts.
- Fully functional prototype with app, sensors and camera.



8 Benefits

- Low cost
- Modular
- Retrofit
- Easy to scale
- Local processing
- Enhances driver and parking safety in one solution

Live Demo at the Booth

Explore the app, observe BLE communication with the ESP32, risk alerts and rear camera integration in the DriveGuard prototype.

QR code / more information