



FINAL PRESENTATION  
**DRIVESENSE**

Drive Aware. Drive Smart. DriveSense.

LOCKEDIN LTD

Winter 2025 – University of Ottawa  
Group 3

CEG 4912 – Computer Engineering Design Project I

# Meet the Team

CCG



**Keith Tran**

Management Lead



**Hajar Fguir**

Web Developer



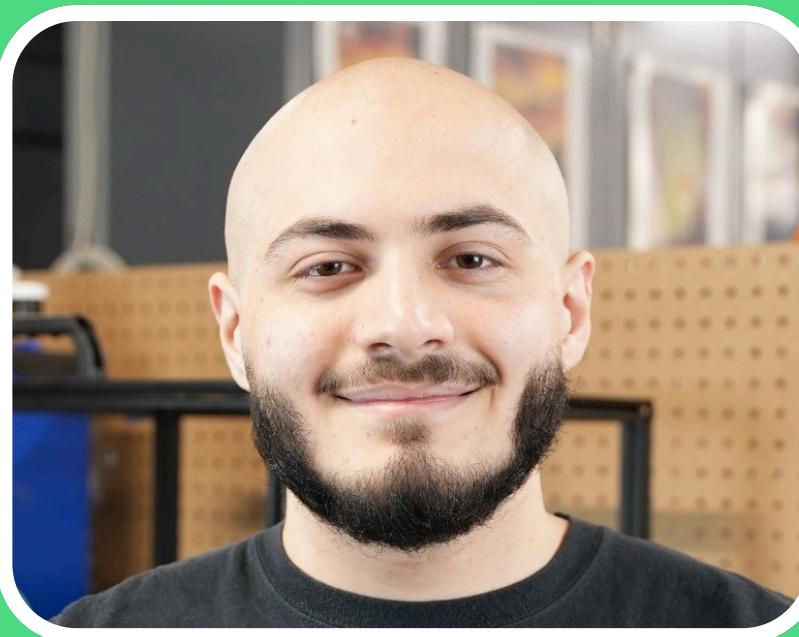
**Kevin Dang**

Web Developer



**Aaditya Shah**

Tech Lead



**Abdullah Ramadan**

CAD Designer



**Saurav Guduru**

Scrum Master

# Project Description

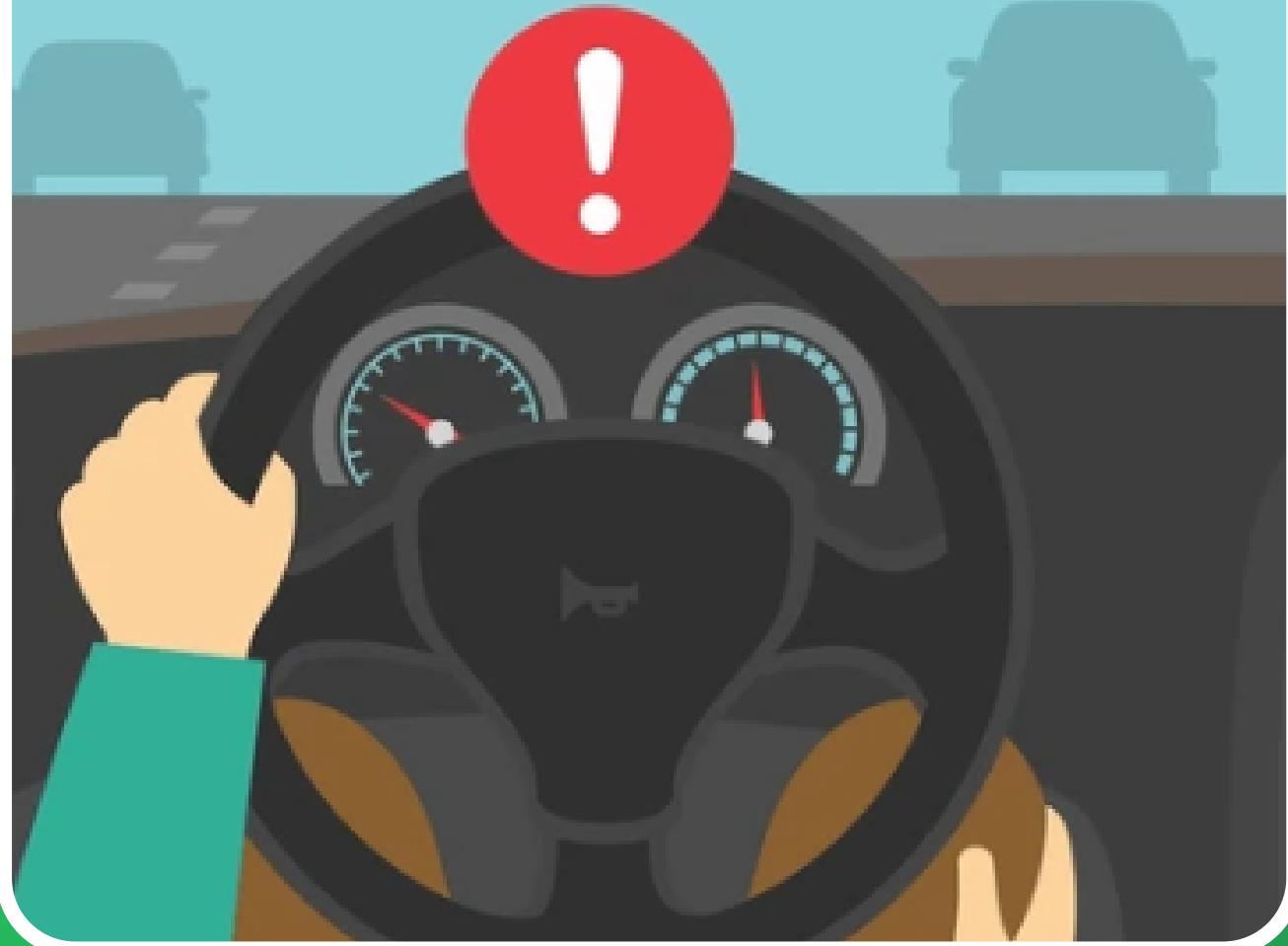
DriveSense is a driver alert system designed to monitor and assess a driver's attentiveness in real-time. By integrating sensors, cameras, and intelligent software, the system detects signs of drowsiness or distress, helping to prevent accidents and save lives.

## Vision

To enhance road safety through real-time driver monitoring using smart technology.

## Mission

To build a compact, sensor-based system that detects drowsiness.



# THE ARCHITECTURE OF THE PROJECT

- Detecting drowsiness.
- Alerting the driver.
- Logging events securely.
- Enabling immediate access to critical information through a user-friendly interface.



## Hardware Implementation

Detecting drowsiness using embedded sensors.



## Software Development

Handling real-time alerting including a user-friendly UI.



## Cloud Integration

Storing logs/event details in the cloud.



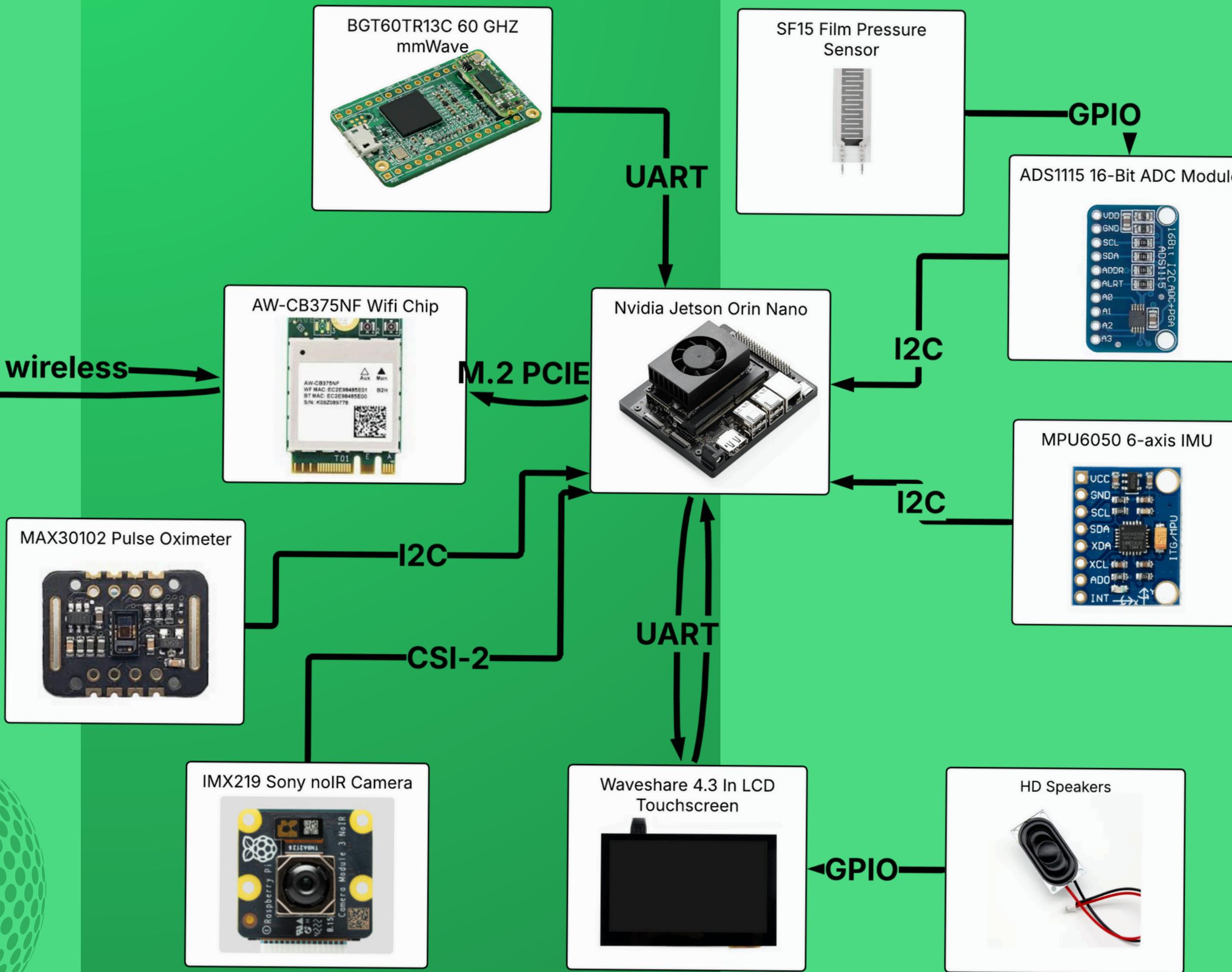
## AI Model

Training a model to identify driver drowsiness.



# HARDWARE Architecture

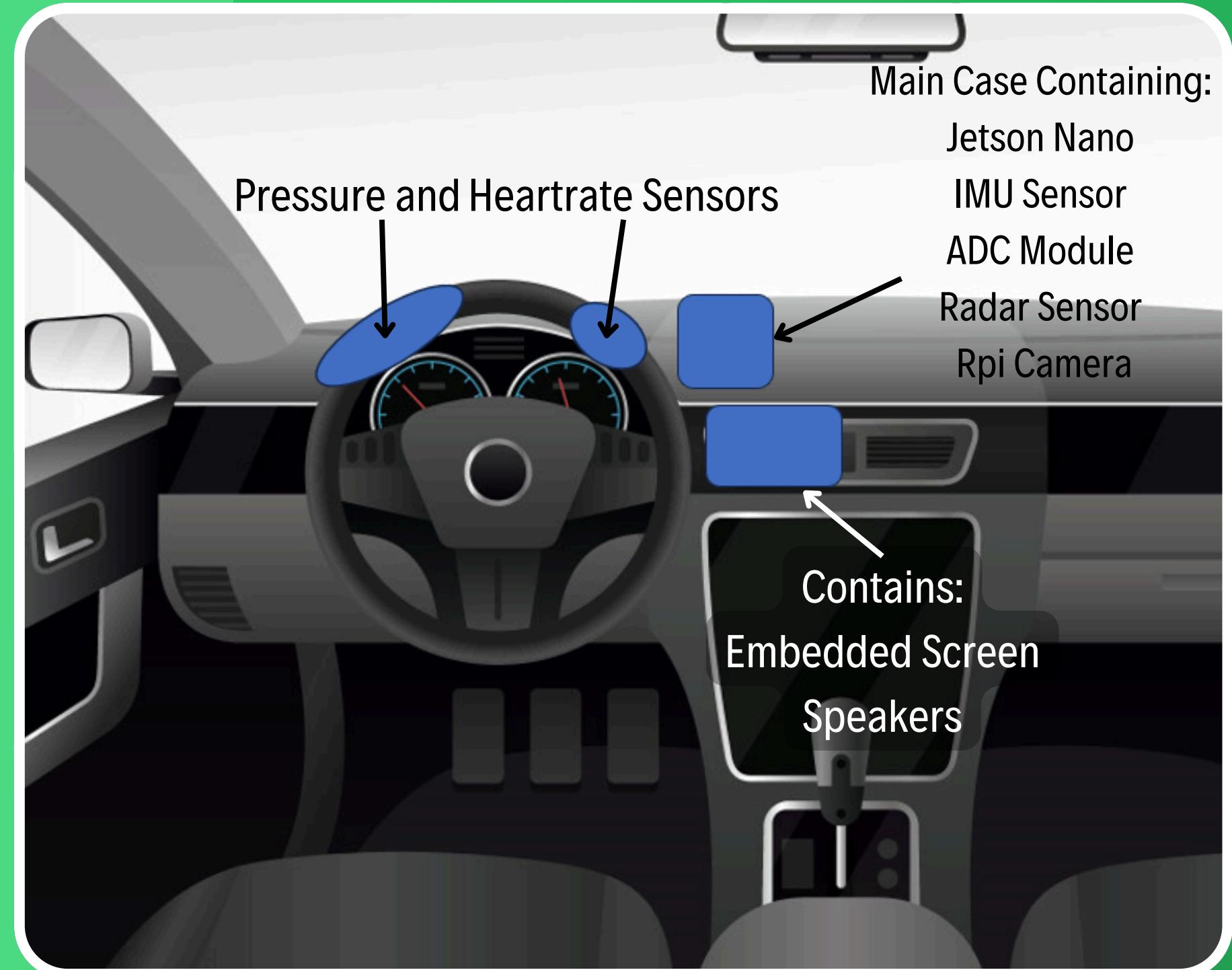
-801 AC wireless



- Single Board Computer (SBC)
- Analog Digital converter (ADC)
- Bluetooth/Wireless module
- MM wave Radar sensor
- Pulse Oximeter sensor
- Raspberry Pi IR Camera
- IMU sensor
- Flexible pressure sensor
- LCD Touch Screen
- Speaker

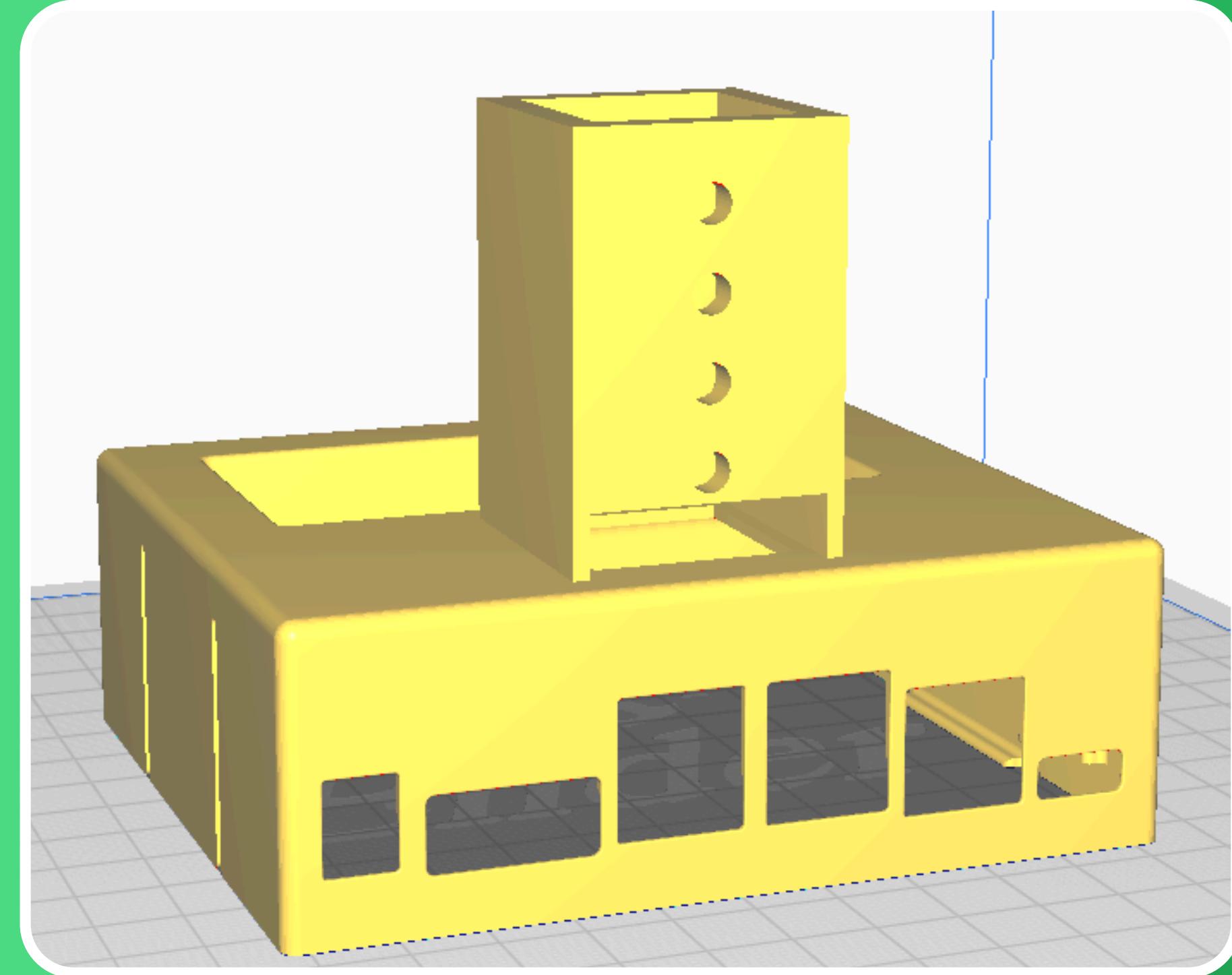
# CAD DESIGN

- **3D Printed Prototype Components**
- **Hold all sensors and devices in place through road disturbance**
- **Steering Wheel Cover will hold all the sensors attached to the wheel**



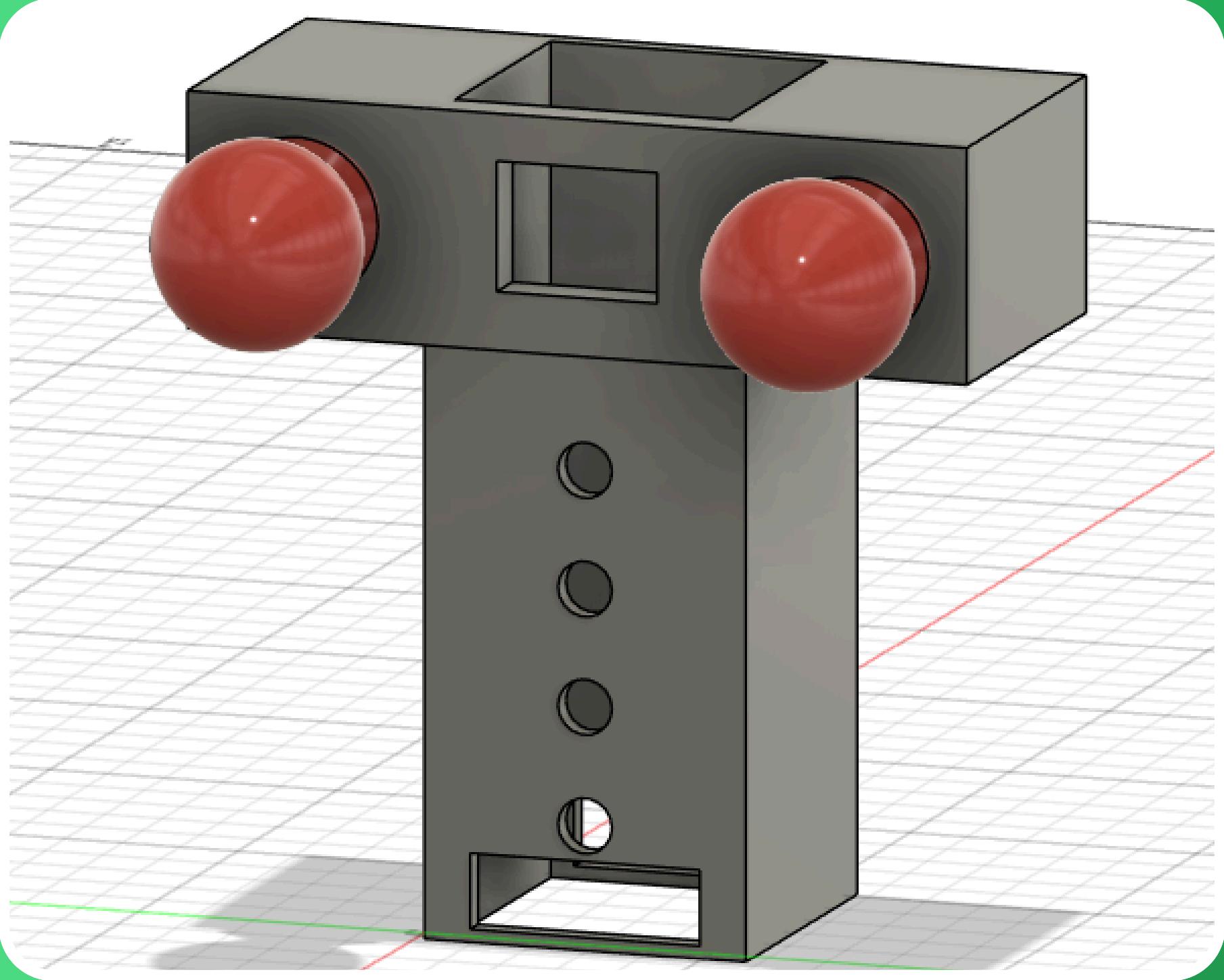
# Main Body

- Jetson Orin Nano
- Raspberry Pi Camera
- IMU Sensor
- ADC Module
- Mount for extension

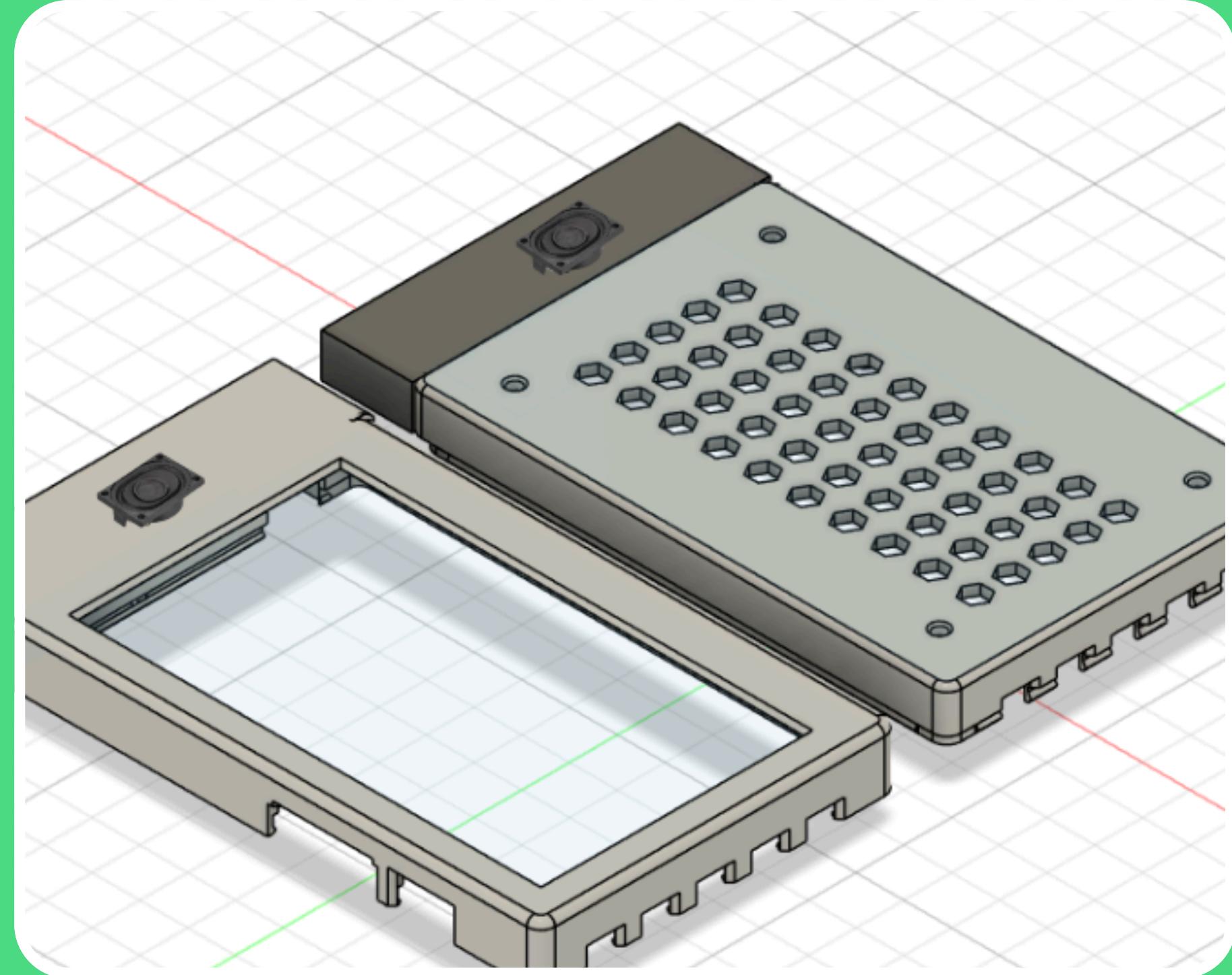


# Extension Arm

- Extension Arm Slides into main body
- Ball & Socket Joint Allows Camera and Radar Sensor Adjustability
- 4 height settings to accommodate for different car models

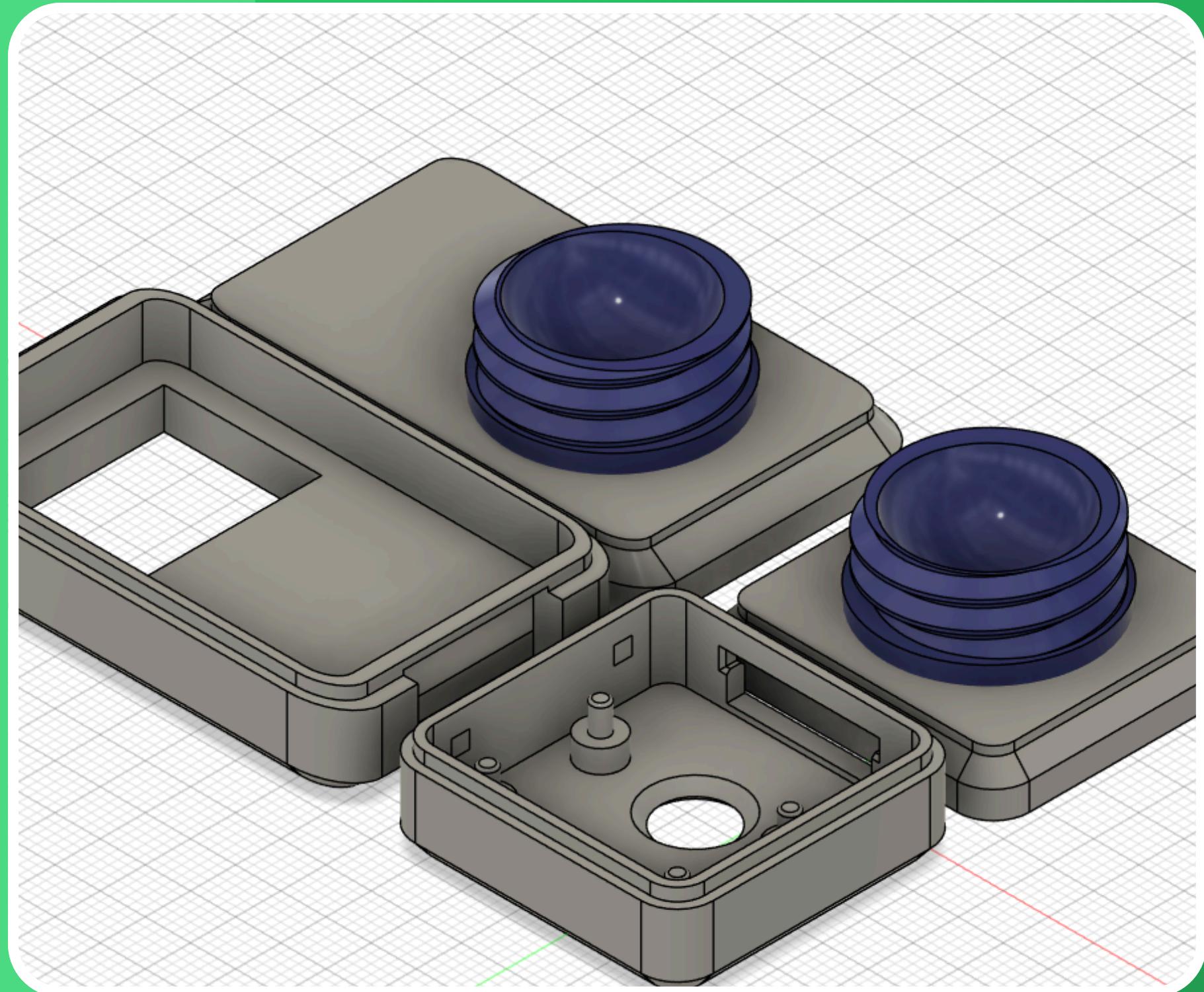
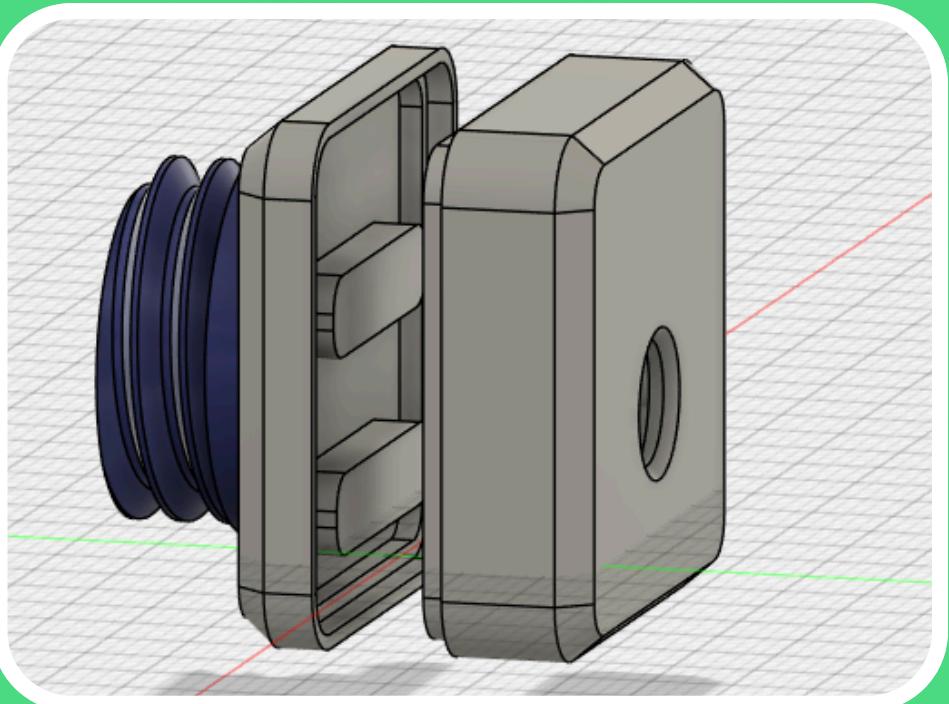
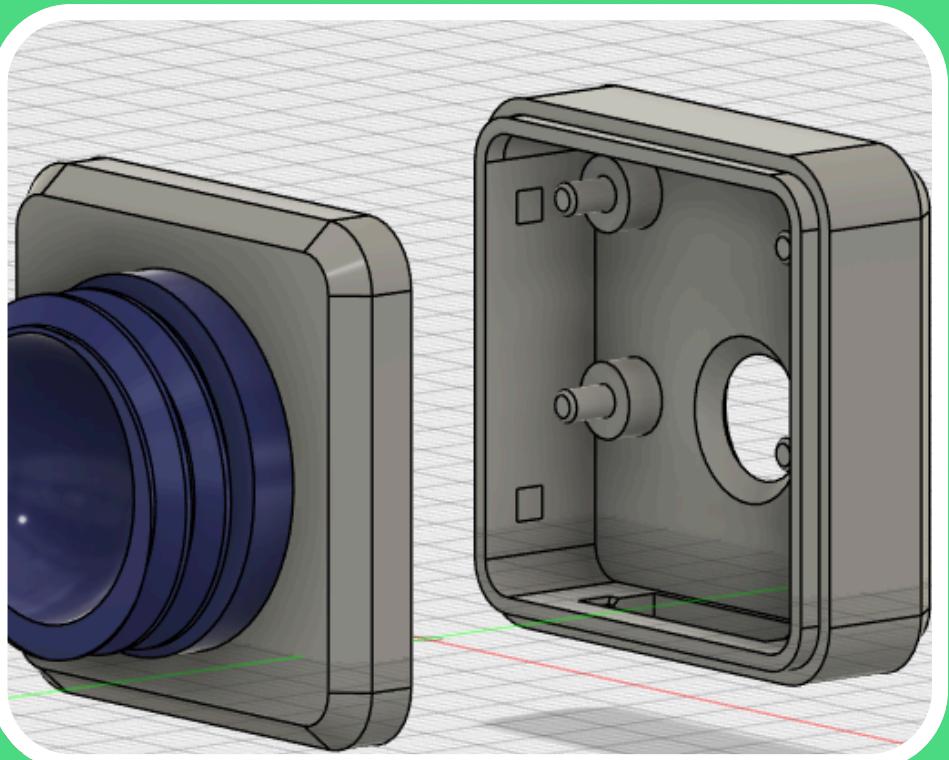


# Embedded Screen with Speakers

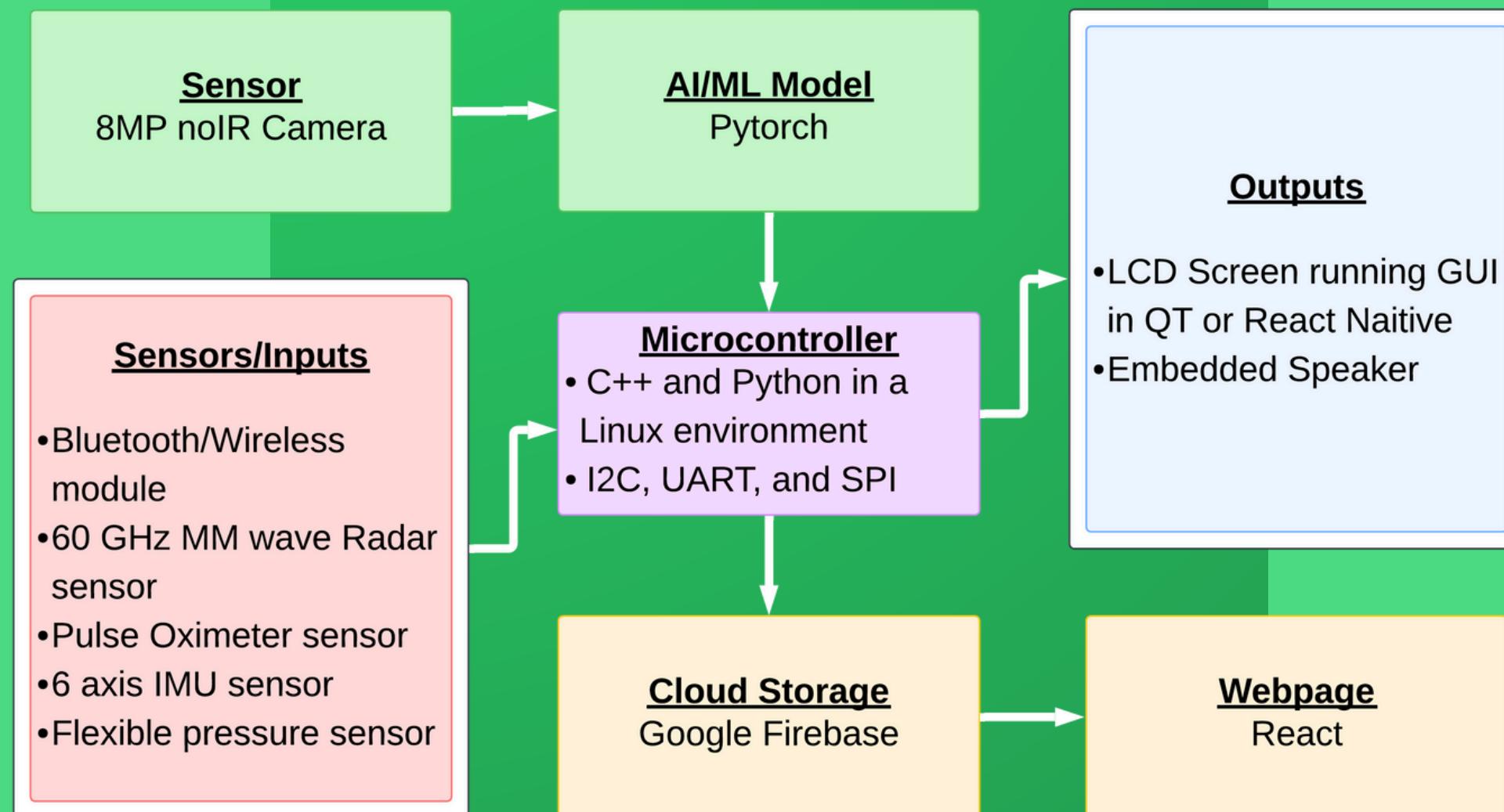


- Mounted via any commercial car phone holder

# Radar Sensor and Camera Mount Casing



# SOFTWARE Architecture



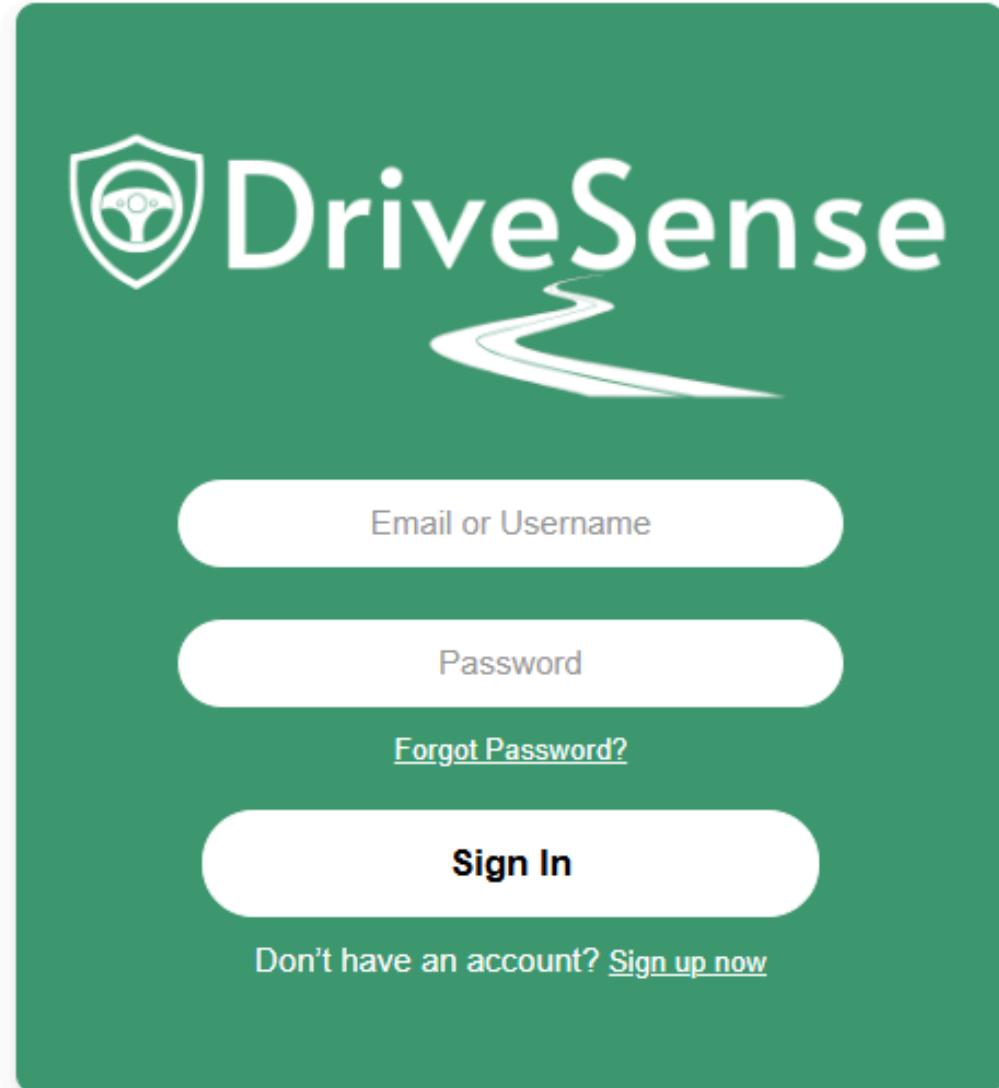
The software architecture of the system is designed to help interaction between sensors, AI processing, cloud storage, and user interfaces. As illustrated in the provided software architecture diagram, the system consists of multiple components working together.

- AI/ML computer vision facial scanning
- Storage Bucket Cloud database
- React Frontend and GUI
- Embedded sensor drivers and communication protocols

# Front-End (GUI)

The website interface, built with React.js, allows secure login and management of driver profiles. Users can view driver status in real time, access logs, and navigate through a clean, responsive dashboard.

- Secure Login
- Driver profile
- Logs/events



## Create Account



[Change Photo](#)

First Name

Last Name

Email

Phone Number

Password

[Already have an account? Sign in](#)

[Create Account](#)



## Forgot Your Password?

Enter your email to receive a password reset link

Email

**Reset Password**

[Return to Sign In](#)

# Connected Drivers

[+ Add Driver](#) Search by name

Sort by ▾



**David Brown**  
Status: Severe  
Driving: Yes

[Edit Driver](#)  
[Remove Driver](#)



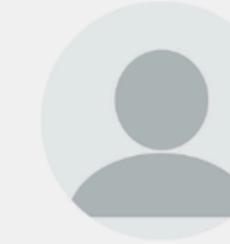
**Joe Smith**  
Status: LockedIn  
Driving: Yes

[Edit Driver](#)  
[Remove Driver](#)



**Joe Rogan**  
Status: Unstable  
Driving: Yes

[Edit Driver](#)  
[Remove Driver](#)



**Alice Wills**  
Status: Idle  
Driving: No

[Edit Driver](#)  
[Remove Driver](#)



Joe Smith

Heart Rate

**71 BPM**

Good

Breathing Rate

**40 BrPM**

Mild

Vehicle Speed

**32 km/h**

Good

## Events

### Event 1: January 29th, 2025

Severity:

Mild

Heart Rate:

128 BPM

Breathing Rate:

54 BPM

Vehicle Speed:

140 Km/h

Wheel Hold Time:

1 minute 30secs



## Add New Driver

[Change Photo](#)

First Name

Last Name

Phone Number

Product ID

### Emergency Contact

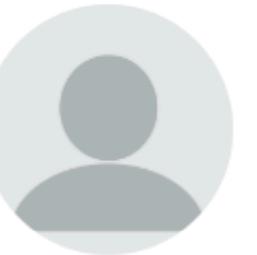
First Name

Last Name

Phone Number

[Add Driver](#)

## Edit Driver

[Change Photo](#)

First Name

Joe

Last Name

Smith

Phone Number

Phone Number

Product ID

Product ID

### Emergency Contact

First Name

First Name

Last Name

Last Name

Phone Number

Phone Number

[Save Changes](#)

## Edit Account

[Change Photo](#)

First Name

 First Name

Last Name

 Last Name

Email

 Email Address

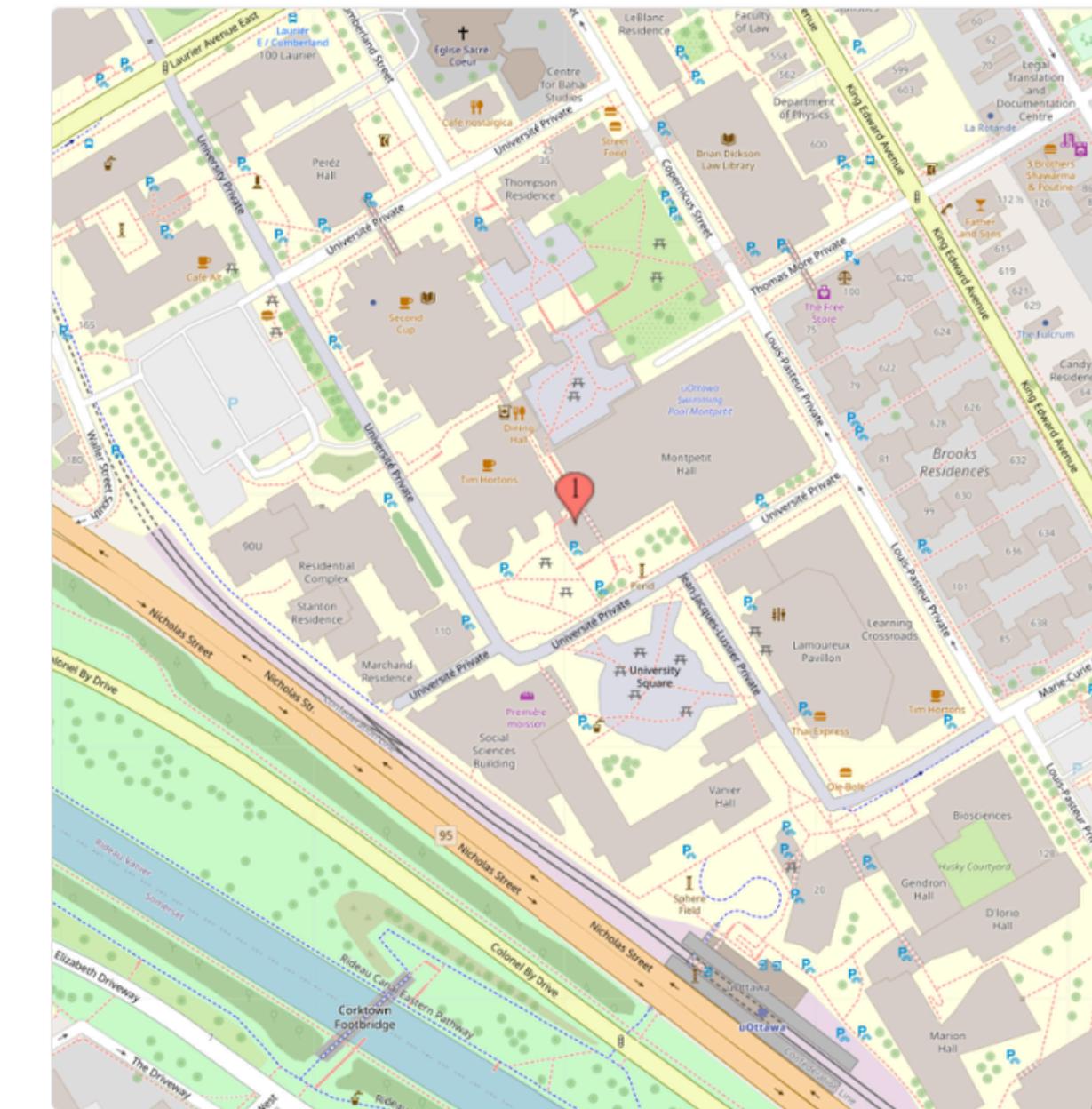
Phone Number

 Phone Number

Password

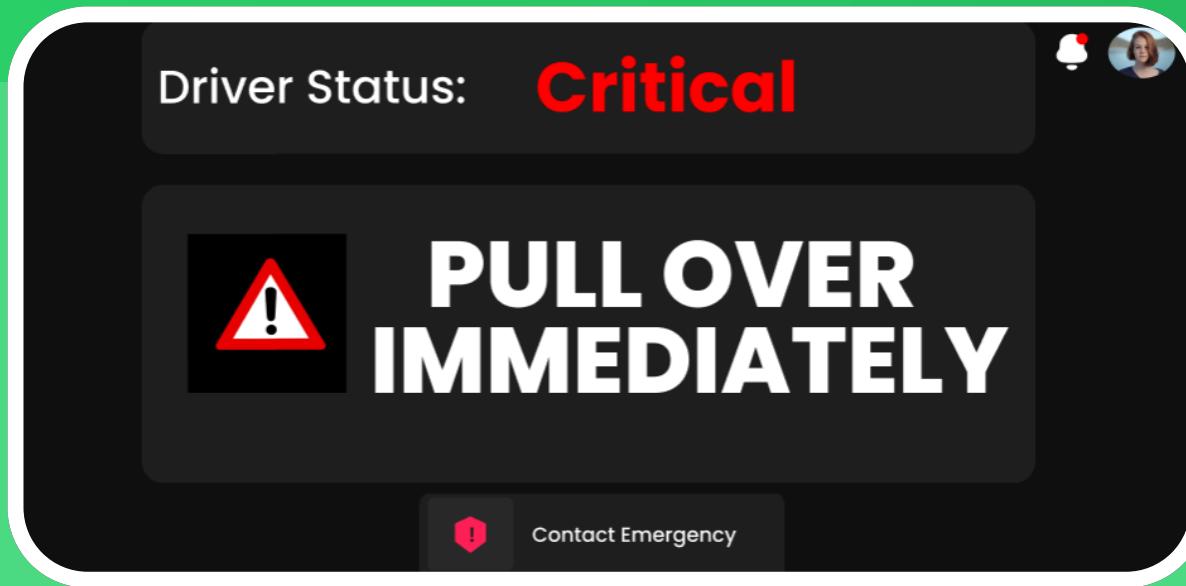
 Password[Save Changes](#)

## Contact Us

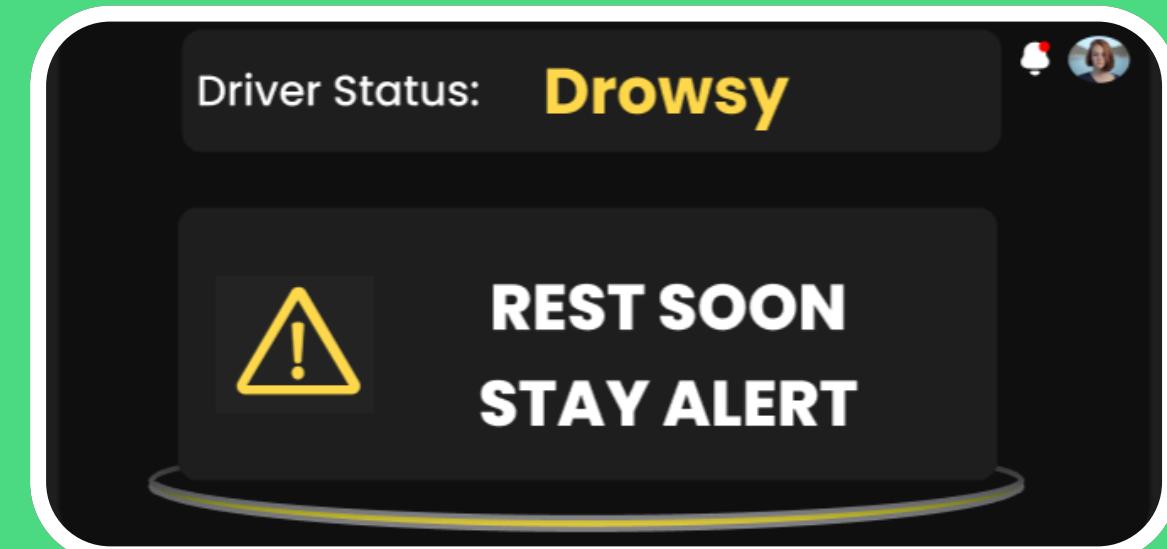
**First Name****Last Name****Email Address****Message****Send Message**

# MOCK UI DRAWING FOR THE SMALL EMBEDDED SCREEN

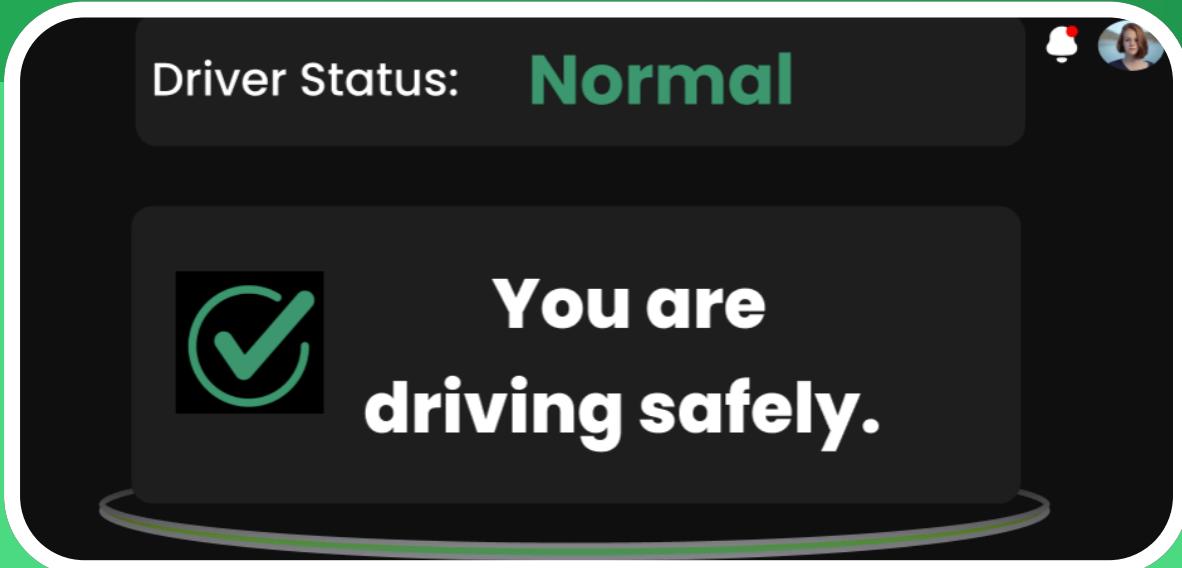
- **Critical:** Severe or sustained drowsiness, emergency option enabled.
- **Drowsy:** Early signs of tiredness detected, soft alert shown.
- **Normal:** Driver is alert, no signs of fatigue.



Display screen during critical status.  
Click "Contact Emergency".



Display screen during drowsy status.  
Tapping the screen will dismiss the message.



Display screen during normal status.  
Tapping the screen will dismiss the message.



# Firebase

The screenshot shows the Firebase Realtime Database interface. The path in the top left is `drivers > name`. The top right features a "More in Google Cloud" button with a dropdown arrow. The main area displays a hierarchical database structure:

- At the root level, there is a "(default)" entry with a "Start collection" button.
- Under "(default)", there is a "drivers" entry with a "name" child node.
- Under "drivers", there is a "name" entry with a "Start collection" and "Add field" button.
- Under "name", there is a "name" entry with a "Start collection" and "Add field" button.

A message at the bottom right states: "This document has no data".



# Firebase

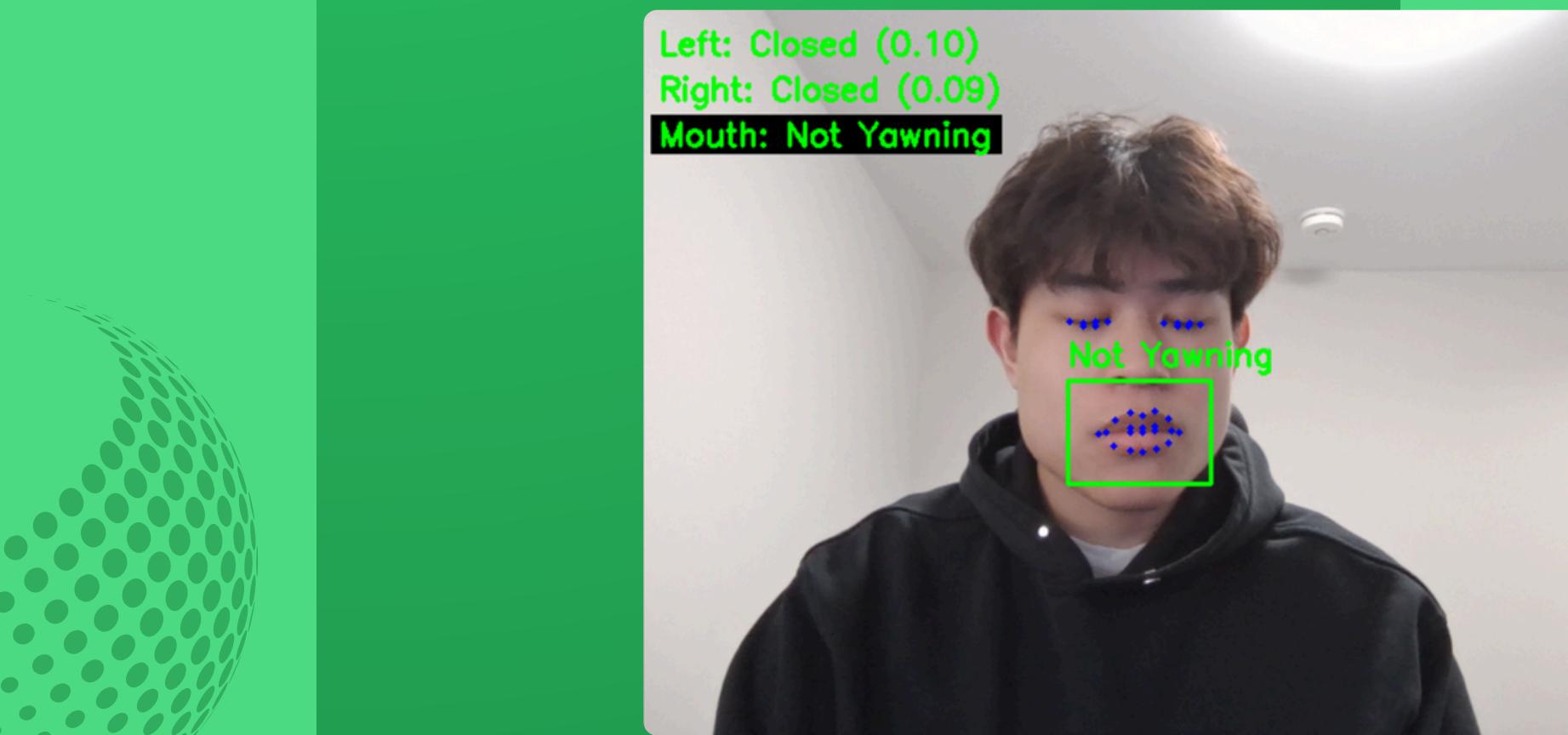
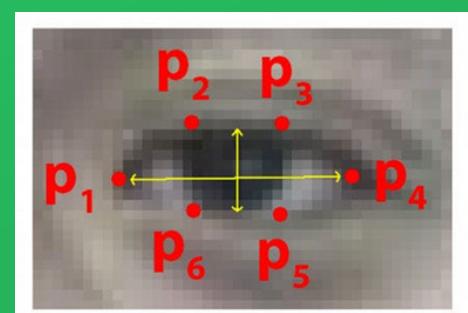
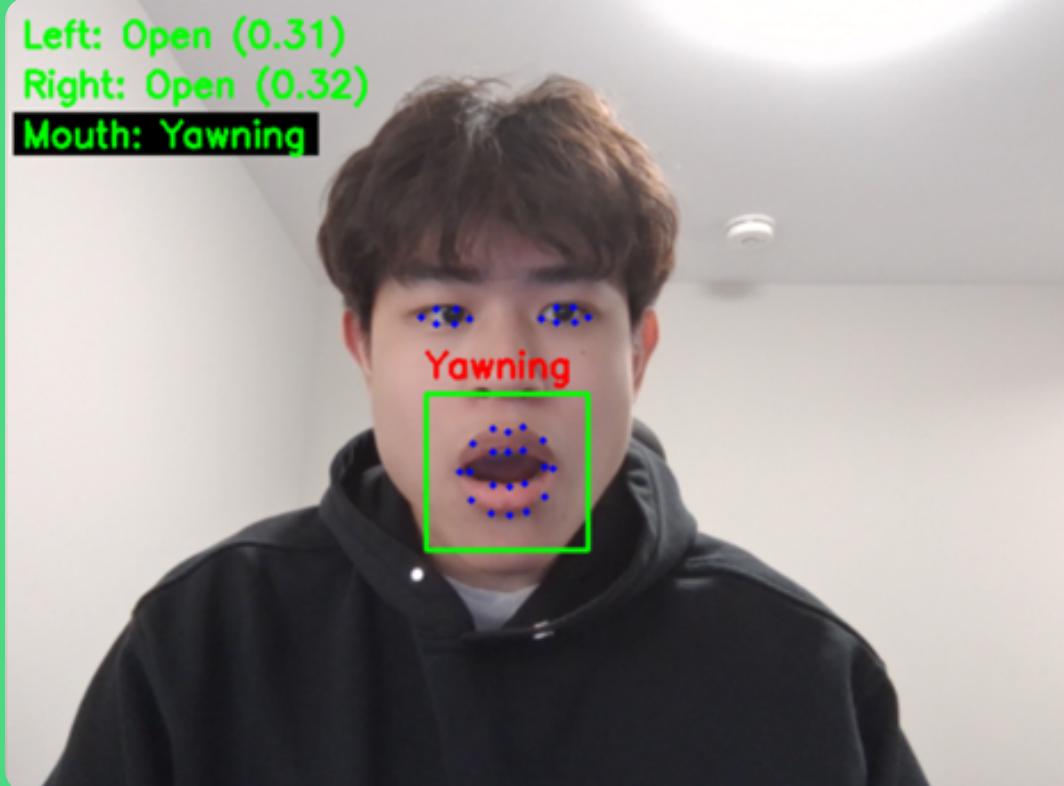
The screenshot shows the Firebase Realtime Database interface. The path in the top navigation bar is `sensors > sensor_1`. The left sidebar lists collections: `(default)`, `drivers`, and `sensors`. The main area displays the `sensors` collection, which contains a single document named `sensor_1`. This document has a nested collection named `readings`. A button labeled `+ Add field` is visible at the bottom of the document's details panel. A note at the bottom states: *This document does not exist. It will not appear in queries or snapshots.* [Learn more](#).

More in Google Cloud ▾

(default)	sensors	sensor_1
+ Start collection	+ Add document	+ Start collection
drivers	sensor_1	readings
sensors		+ Add field

*This document does not exist. It will not appear in queries or snapshots.* [Learn more](#)





# AI Model

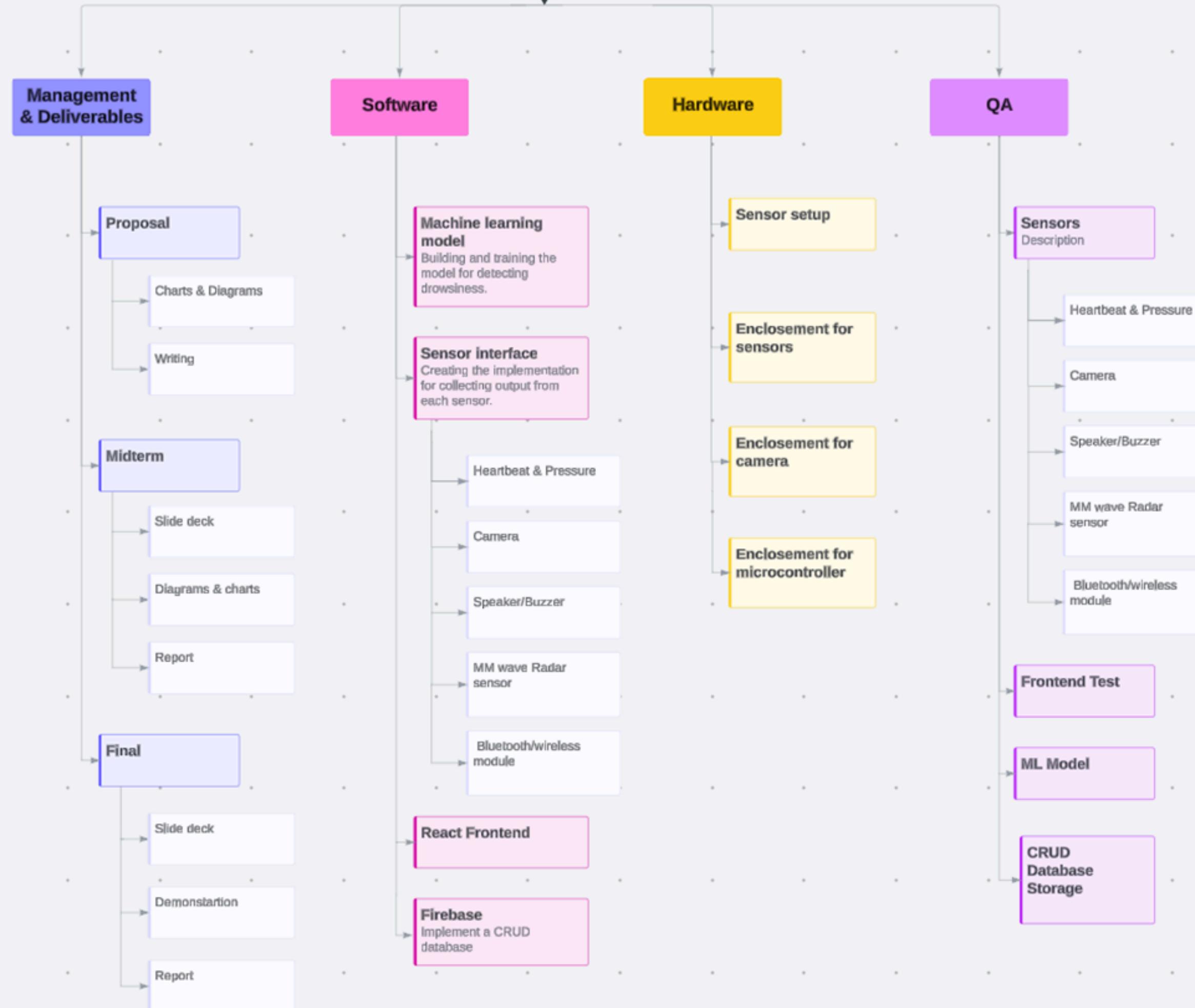
Two AI models for drowsiness detection are implemented: one detects eye closure based on the Eye Aspect Ratio (EAR) using facial landmarks, and the other uses a CNN to detect yawning from facial images. Both models work in real time and feed their predictions to a meta-model that classifies the driver's state.

- Eye Detection Model
- Yawning Detection Model

<b>Mint-chocolate-chip</b>	<a href="#">Public</a>
a repository for CAD designs	
0    0    0    0   Updated 5 minutes ago	
<b>Cookies-n-cream</b>	<a href="#">Public</a>
Repository for the website	
JavaScript    0    MIT    0    0    0   Updated 5 hours ago	
<b>Coconut</b>	<a href="#">Public</a>
Database services	
0    0    0    0   Updated 20 hours ago	
<b>Green-Tea</b>	<a href="#">Public</a>
Repository for ML model	
Python    0    0    0    0   Updated 3 days ago	
<b>Maple-walnut</b>	<a href="#">Public</a>
Repository for the jetsons software	
Python    0    0    0    0   Updated 4 days ago	
<b>Pistachio</b>	<a href="#">Public</a>
Repository for the Screen	
JavaScript    0    0    0    0   Updated last week	
<b>Mango</b>	<a href="#">Public</a>
For course deliverables	
0    0    0    0   Updated last month	

# GitHub Snapshot



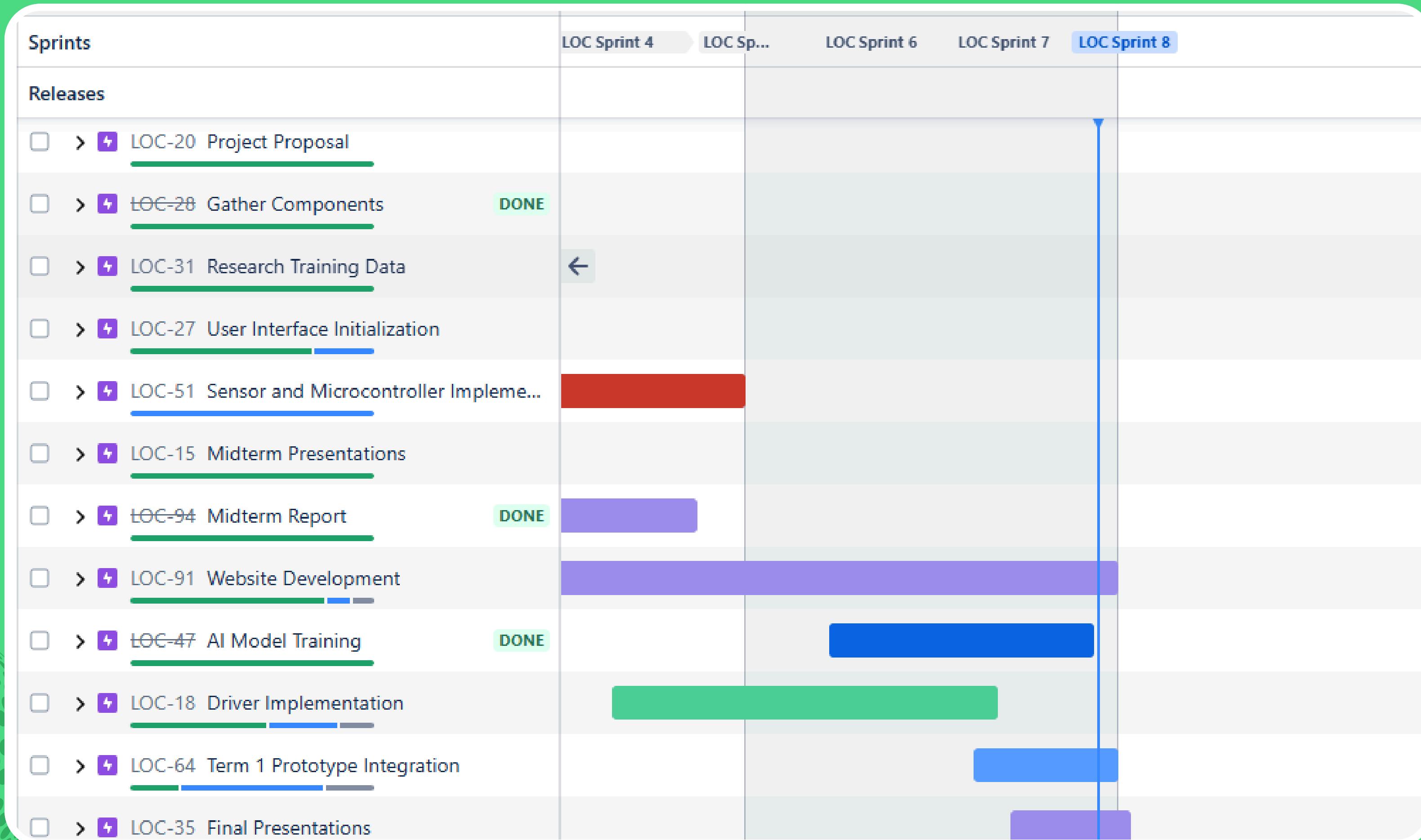


# Work Breakdown Structure - WBS



# GANTT CHART

[Gantt Chart Link](#)



# GANTT CHART

[Gantt Chart Link](#)

DriveSense

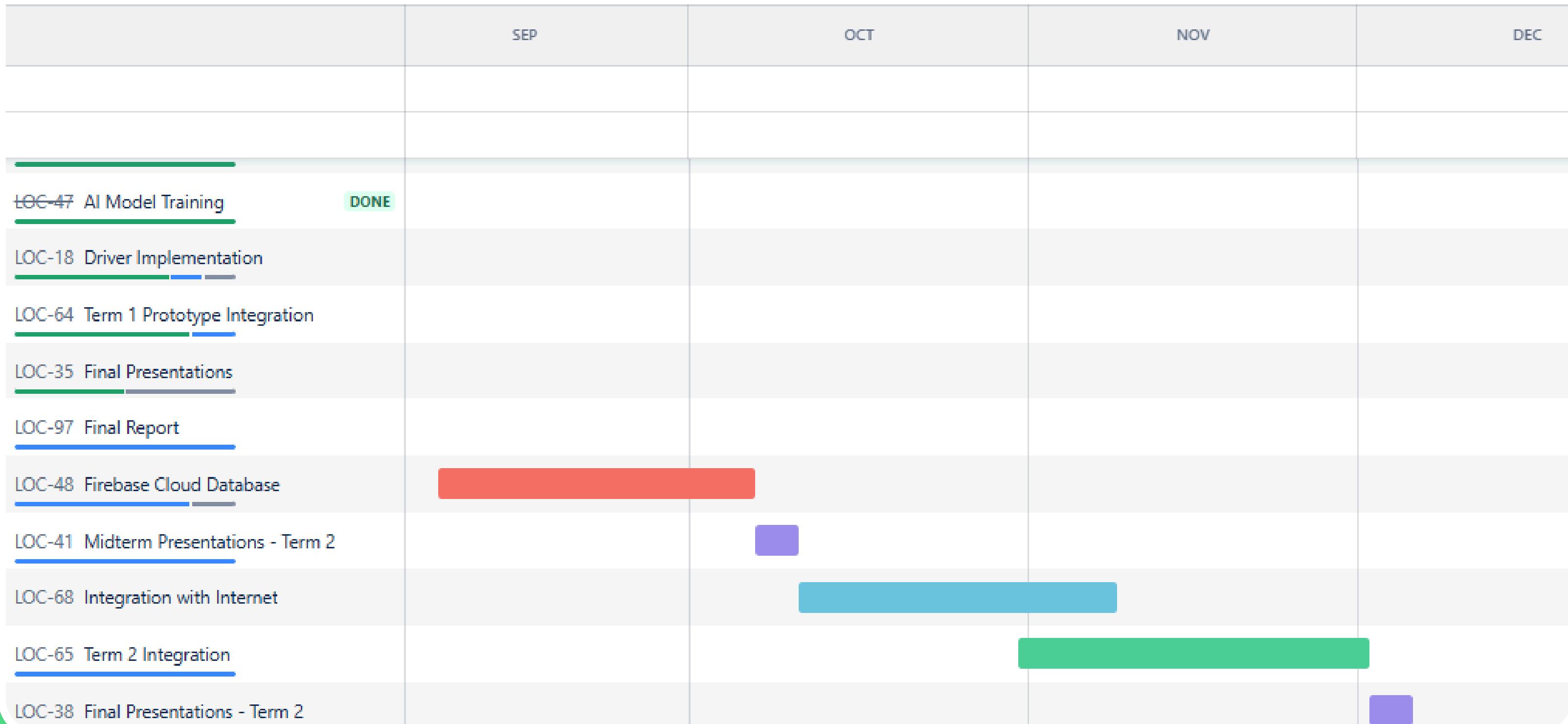
1e



Status category

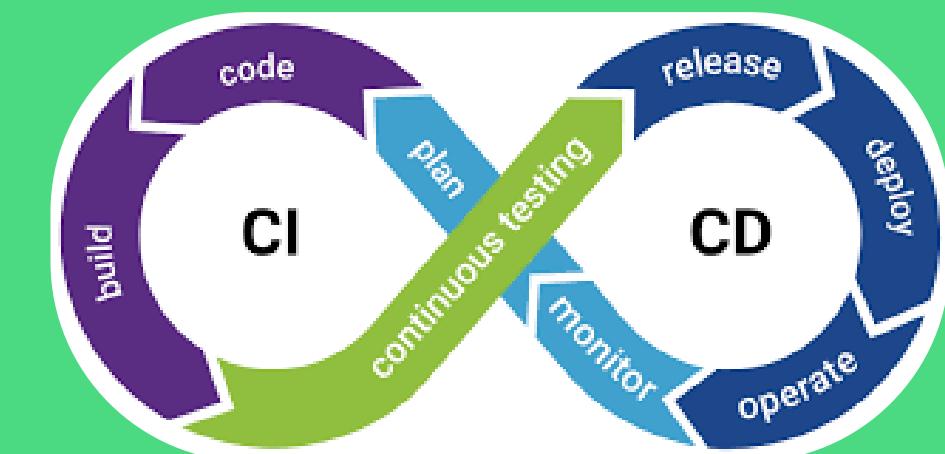
Epic

Type



# Agile Management Board - JIRA

[Jira Board Link](#)



BACKLOG 9

- Final Project Report - Term 2  
**FINAL PRESENTATIONS - TERM 2**  
LOC-39
- Final Presentation Slide Deck - Term 2  
**FINAL PRESENTATIONS - TERM 2**  
LOC-40
- Midterm Presentation Slide Deck - Term 2  
**MIDTERM PRESENTATIONS - TERM 2**  
LOC-42
- Midterm Project Report - Term 2  
**MIDTERM PRESENTATIONS - TERM 2**  
LOC-43
- Add storage interface with MCU  
**FIREBASE CLOUD DATABASE**  
LOC-49
- REST API for create entry  
**FIREBASE CLOUD DATABASE**  
LOC-50
- REST API for delete entry  
**FIREBASE CLOUD DATABASE**  
LOC-52

TO DO 1

- Create a driver for MM Wave Radar Sensor  
**DRIVER IMPLEMENTATION**  
LOC-26

+ Create issue

IN PROGRESS 5

- Final Project Report  
**FINAL REPORT**  
LOC-37 KT
- Sensor Setup  
**SENSOR AND MICROCONTROLLER IMPL...**  
LOC-56 AS
- Export Electron Js to run on ARM 64  
**USER INTERFACE INITIALIZATION**  
LOC-95
- Design REST APIs for User Interface  
**USER INTERFACE INITIALIZATION**  
LOC-96
- Screen UI Implementation  
**DRIVER IMPLEMENTATION**  
LOC-29

DONE 13 ✓

- Implement Event Log Screen  
**WEBSITE DEVELOPMENT**  
LOC-46 KD
- Create a driver for a heartbeat sensor  
**DRIVER IMPLEMENTATION**  
LOC-49 AS
- Manage Account page  
**WEBSITE DEVELOPMENT**  
LOC-84 KD
- Contact Us page  
**WEBSITE DEVELOPMENT**  
LOC-85 KD
- Edit Driver Page  
**WEBSITE DEVELOPMENT**  
LOC-90 KD
- Sensor Casings  
**SENSOR AND MICROCONTROLLER IMPL...**  
LOC-57 AR
- Final Presentation Slide Deck  
**FINAL PRESENTATIONS**  
LOC-36
- MCU Casing CAD

# Project Progress

CCG

**Team Contributions Overview:** Breakdown of implemented and in-progress modules assigned to each team member.

Task	Status	Team member(s)
User Interface	In progress	Hajer
Database Manipulation	In progress	Saurav
AI Model	In progress	Saurav & Kevin
Website	In progress	Keith & Kevin
Microcontroller and Sensor Implementation	In progress	Aaditya
CAD Design and Printing	In progress	Abdullah



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# THANK YOU !