

**MICHIGAN STATE**  
**UNIVERSITY**

# Project Plan Presentation

## Automotive Software Integration In Virtual 3D

### The Capstone Experience

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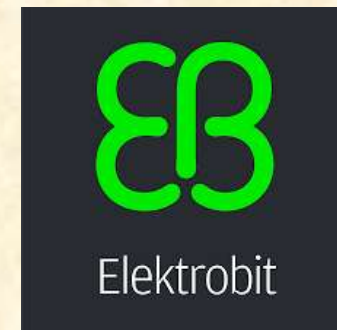
Spring 2024



*From Students...  
...to Professionals*

# Project Sponsor Overview

- Specializes in advanced automotive software
- Maintains a global presence, powering over 5 billion devices on over 600 million vehicles
- A leader in automotive software with over 35 years of serving the industry
- German company, spans three continents and eleven countries



# Project Functional Specifications

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- Expensive to physically build vehicle hardware components
- Simulate vehicle hardware inputs (GPS, Acceleration, Velocity and Obstacles) in a UI vehicle dashboard
- Save money for Elektrobot and time for testing engineers

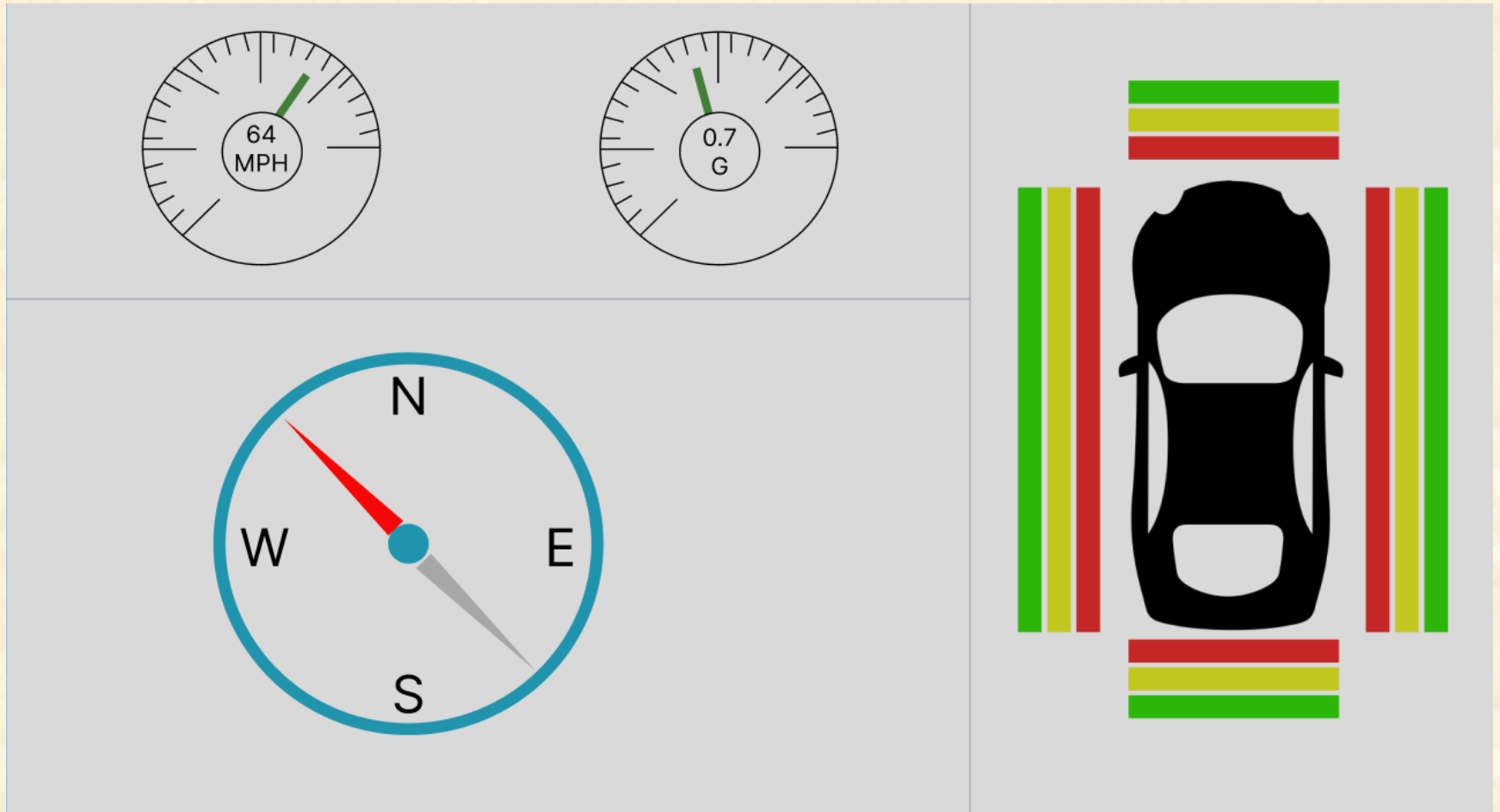


# Project Design Specifications

- GPS Data
  - Simulate a compass
- Acceleration Data
  - Simulate an accelerometer
- Velocity Data
  - Simulate a speedometer
- Obstacle Detection
  - Simulate a vehicle obstacle detection sensor
- User Interface Development
  - Design and develop a new UI tab to display the processed data as a vehicle dashboard

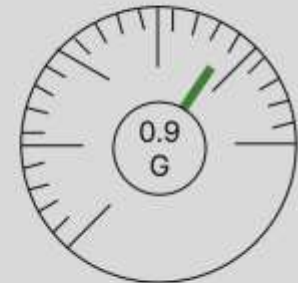
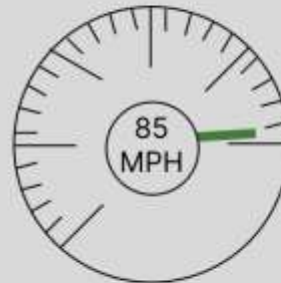


# Screen Mockup: Full Display



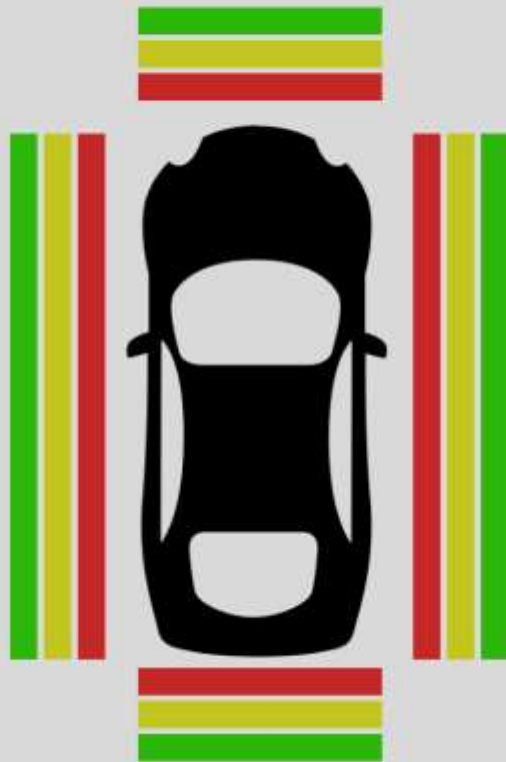
# Screen Mockup: Speedometer/G-force

Example: Velocity and  
Acceleration Variation

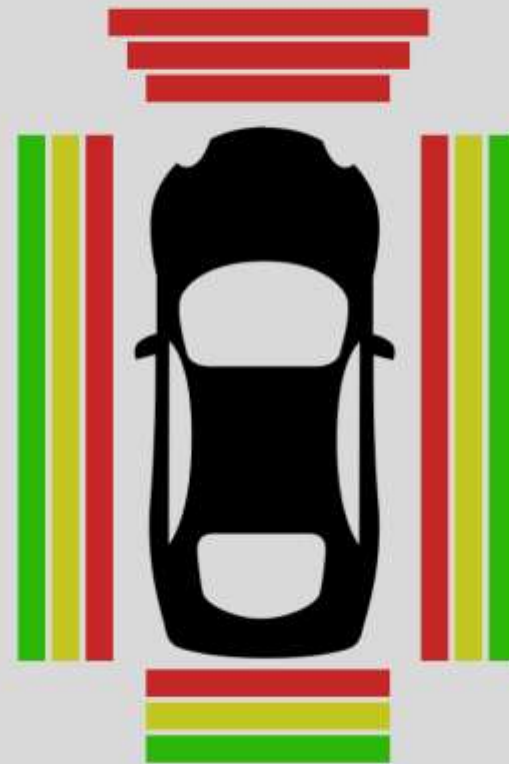


# Screen Mockup: Proximity Sensors

Clear Surroundings



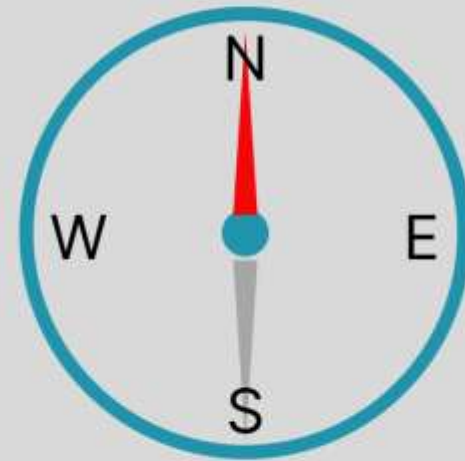
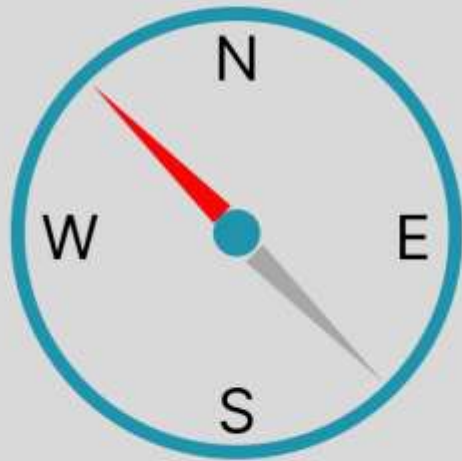
Object Near Front





# Screen Mockup: Compass

Compass Direction Change (from GPS sensor)



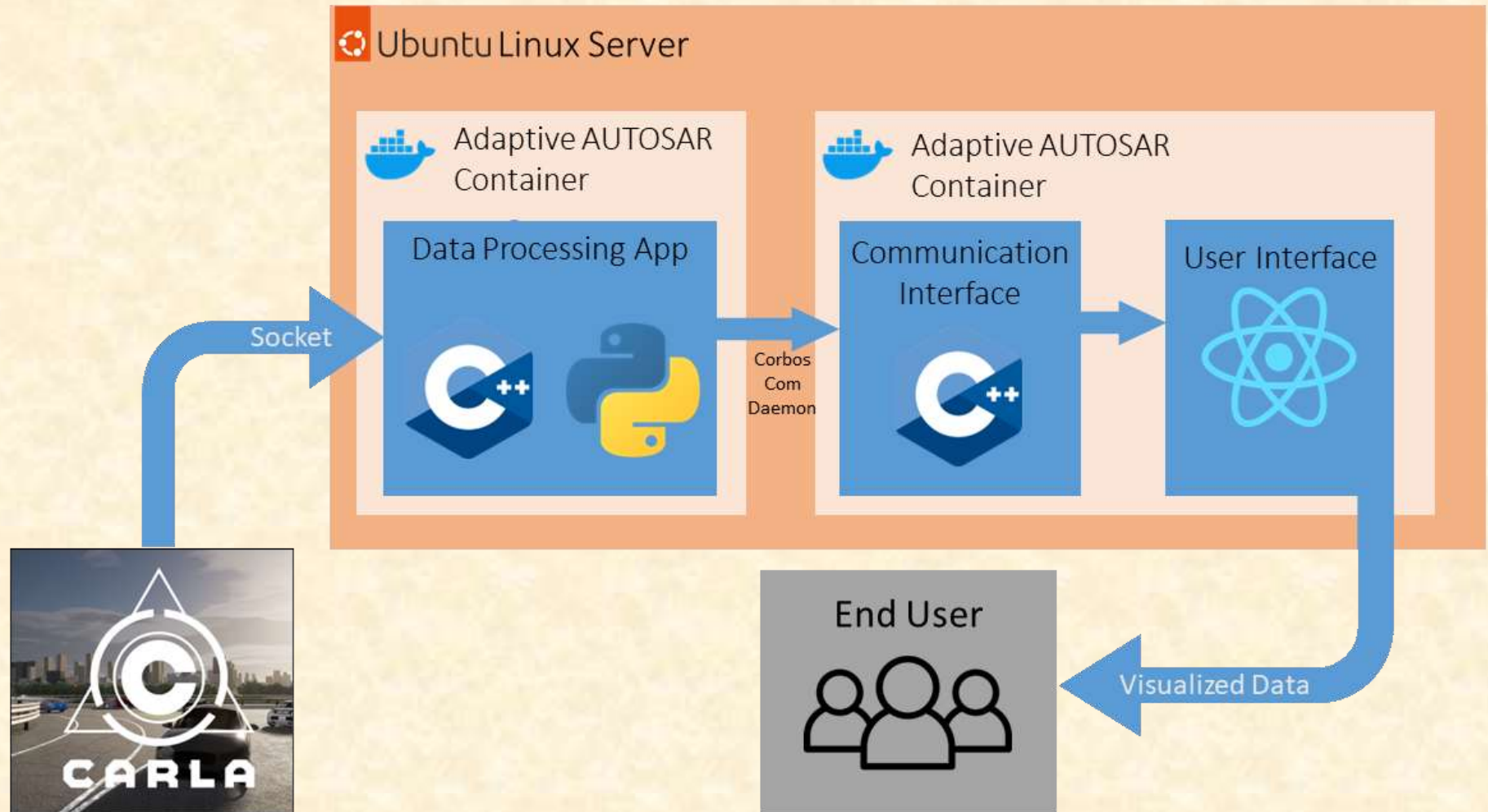


# Project Technical Specifications

- CARLA simulates sensor hardware
  - Python API to configure sensors and export data
  - Runs on device with capable GPU
- CARLA Mock service to generate random sensor data
- Adaptive AUTOSAR containers run with Docker
  - Provides AUTOSAR Runtime for Adaptive Applications (ARA)
  - Runs on Ubuntu server
- Adaptive AUTOSAR Server container processes raw sensor data from CARLA or CARLA Mock
- Adaptive AUTOSAR Interface container receives processed data and displays it using React.js



# Project System Architecture



# Project System Components

- Hardware Platforms
  - Capstone Lab Server (for Adaptive AUTOSAR containers)
  - Machine with a dedicated graphics card with at least 6GB VRAM for CARLA
- Software Platforms / Technologies
  - AUTOSAR Runtime for Adaptive Applications (ARA)
  - Docker
  - Ubuntu, Windows
  - Python, C++
  - React.js, JavaScript/JSX, HTML, CSS



# Project Risks

- Risk 1
  - Description: CARLA might potentially run slow if we have a lot of cameras
  - Mitigation: Lower rendering resolution, or disable rendering completely
- Risk 2
  - Description: CARLA's code base is large and understanding it can be challenging
  - Mitigation: Team members will research CARLA's codebase independently and together
- Risk 3
  - Description: We are unsure about our client's expectations for the UI design.
  - Mitigation: Clarify with our client about real-world usage of the app



# Questions?

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