# TECHIN515: Hardware and Software Lab 2

## Three Project Ideas

# Healthcare & Accessibility: AI-Powered Smart Glasses for the Visually Impaired
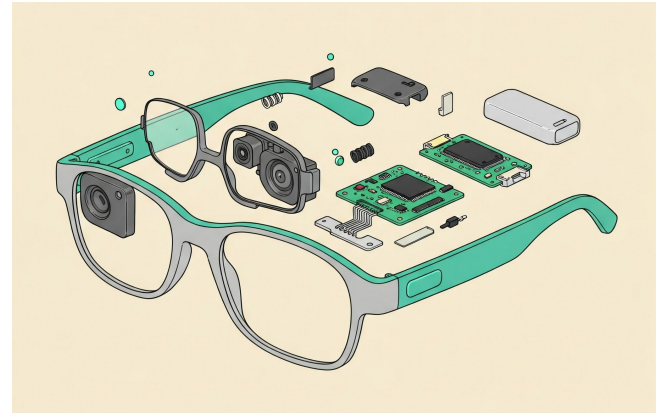
**Description:**
A wearable smart glasses system that assists visually impaired individuals by identifying objects, reading text aloud, and providing real-time navigation assistance using AI-powered computer vision and audio feedback.

**Intended User:**
Visually impaired individuals, accessibility advocates, healthcare providers.

**Technical Elements:**

- **Sensors:** Camera (for real-time image recognition), LiDAR sensor (for obstacle detection).

- **Edge Processing:** AI-based object detection and text recognition performed on-device for fast response.

- **DSP/ML:** Deep learning model for scene understanding, facial recognition, and text-to-speech conversion.

- **Cloud Computing:** Optional cloud-based updates to improve AI model accuracy over time.

- **Enclosure:** Lightweight, ergonomic, and stylish glasses frame with integrated hardware.

- **PCB:** Custom circuit board for low-power processing and wireless connectivity.

# Automotive Industry: Smart Adaptive Headlights

**Description:**
A lighting system that dynamically adjusts beam intensity and direction based on road conditions, vehicle speed, and oncoming traffic to improve visibility and reduce glare.

**Intended User:**
Drivers in low-visibility conditions, luxury vehicle manufacturers.

**Technical Elements:**

- **Sensors:** Light sensor, infrared camera for detecting oncoming vehicles.

- **Edge Processing:** Real-time beam adjustment algorithm.

- **DSP/ML:** AI model predicts best beam pattern based on environmental conditions.

- **Cloud Computing:** Logs driving conditions and adjustments for future optimization.

- **Enclosure:** Integrated into existing headlight housing.

- **PCB:** Custom circuit for processing sensor data and controlling LED arrays.

# Sustainability Industry: AI-Powered Smart Donation & Recycling Kiosk

**Description:**
A smart kiosk that incentivizes users to recycle electronics, clothes, or small household items by integrating with crowdfunding platforms. Users can choose to either donate items or receive credits that can be used to fund sustainable projects.

**Intended User:**
Eco-conscious individuals, charitable organizations, crowdfunding platforms.

**Technical Elements:**

- **Sensors:** RFID scanner (to identify items), weight sensor (to classify material).

- **Edge Processing:** AI-powered classification of items based on condition and material.

- **DSP/ML:** Machine learning to recommend recycling, repurposing, or donation options.

- **Cloud Computing:** Connects to crowdfunding platforms where users can allocate credits to projects.

- **Enclosure:** Secure, weatherproof, and interactive kiosk design.

- **PCB:** Custom circuit for sensor integration, payment processing, and connectivity.