# Final Project Proposal

**By Mouhannad Chehab, Mohammad Shehab, Hussein Mourtada**

**Objective:** The objective of this final project is to create a "Smart Health Monitoring System" using the Arduino Nano 33 BLE Sense Rev2. The system will monitor vital environmental conditions and personal health metrics, such as temperature, humidity, air quality, and activity levels, while transmitting data via BLE to a smartphone or computer for real-time analysis and actionable insights.

**Plan for BLE Communication and Sensor Data Usage:**

1. **Sensor Integration:**
   * Utilize the onboard sensors of the Arduino Nano 33 BLE Sense Rev2, including:
     + Temperature and humidity sensor to monitor environmental conditions.
     + Air quality sensor to measure volatile organic compounds and CO2 levels.
     + Accelerometer to track physical activity or motion patterns.
2. **BLE Communication:**
   * The Arduino will function as a BLE peripheral, continuously advertising and transmitting sensor data.
   * A dedicated smartphone app or desktop software will act as the BLE central device, allowing users to:
     + Connect to the Arduino device.
     + Retrieve real-time data streams for visualization and trend analysis.
     + Receive notifications for threshold breaches (e.g., high CO2 levels or sudden motion).
3. **Data Processing:**
   * Sensor data will be processed onboard the Arduino to ensure efficient BLE communication by reducing unnecessary transmissions.
   * The processed data will be grouped into BLE characteristics with unique UUIDs for easy retrieval and integration with other systems.

**Expected Outcomes:**

1. **Real-Time Monitoring:**
   * Users will have access to continuous updates of temperature, humidity, air quality, and activity levels on their mobile device or computer.
2. **Visualization and Alerts:**
   * The system will include graphical visualizations of trends over time (e.g., line charts for temperature changes).
   * Alerts will notify users of critical conditions, such as unhealthy air quality or abnormal motion patterns.
3. **Additional Features:**
   * **Data Logging:** Historical data storage for long-term trend analysis.
   * **Calibration Mode:** Option to calibrate sensors for enhanced accuracy.
   * **Low Power Optimization:** BLE communication will be optimized to minimize energy consumption, extending device operation time.

**Conclusion:** This "Smart Health Monitoring System" will demonstrate the potential of the Arduino Nano 33 BLE Sense Rev2 in real-world applications. By integrating BLE communication with versatile onboard sensors, the project will offer an impactful and practical solution for monitoring environmental and health-related conditions in a connected IoT ecosystem.