**Project Proposal**

Project Title: **Smart Patient Monitoring System**  
Team ID: **65**

**Introduction:**

The Smart Patient Monitoring System is designed to enhance healthcare by providing real-time monitoring of vital signs, including body temperature. The system consists of two components:

1. A **wristband** that continuously monitors the patient’s oxygen saturation level and pulse using the **MAX30102** sensor and transmits data.
2. A side biometric module that periodically alerts the patient to check their vitals, incorporates a **proximity sensor**, **temperature sensor** and includes a **capacitive touch** emergency alert system.

All collected data is sent to a secure web server for remote monitoring. If any parameter falls outside the predefined **safe** **range**, the system will send an **SMS** alert to a designated caregiver via a SIM module and activate an alert mechanism. The goal is to improve response times in medical emergencies and provide a user-friendly health monitoring solution.

**Hardware Requirements**:

**Wristband:**

1. Body Pulse and Oximeter (MAX30102)
   * Quantity: 1 per wristband
   * Purpose: Continuously monitors body oxygen saturation level and the pulse for abnormal fluctuations.
2. ESP32 Microcontroller
   * Quantity: 1 per wristband
   * Purpose: Collects sensor data, processes it, and transmits it to the web server via WiFi.
3. Rechargeable Battery
   * Quantity: 1 per wristband
   * Purpose: Ensures portability and uninterrupted operation.

**Side Biometric Module**:

1. Body Temperature Sensor (MAX30205)
   * Quantity: 1 per module
   * Purpose: Allows periodic measurement of temperature for validation.
2. ESP32 Microcontroller
   * Quantity: 1 per module
   * Purpose: Collects sensor data, processes it, and transmits it to the web server.
3. Proximity Sensor
   * Quantity: 1 per module
   * Purpose: Detects when the patient is away from their bed for more than 30 minutes and triggers an alert to the caregiver.
4. Capacitive Touch Sensor
   * Quantity: 1 per module
   * Purpose: Allows the patient to send an emergency signal to the caregiver by touching the sensor.
5. SIM Module (GSM/GPRS Module)
   * Quantity: 1 per module
   * Purpose: Sends emergency SMS alerts to caregivers via Twilio when critical conditions arise.
6. Buzzer

* Quantity: 1 per module
* Purpose: makes noise when something unusual happens.

**Data Collection Plan**:

* Data Acquisition:
  + The wristband will continuously monitor the patient’s temperature.
  + The side biometric module will periodically prompt the patient to check their vitals.
  + The proximity sensor will monitor the patient's movement in relation to their bed.
* Data Transmission & Storage:
  + The ESP32 microcontroller in both components will process the data and send it to a secure web server.
  + The web server will store and display the patient’s vitals on an online dashboard accessible by caregivers.
* Alert Mechanism:
  + If the patient’s temperature is outside the safe range, the system will:
    - Send an SMS alert to the caregiver via Twilio.
    - Activate an alert mechanism on the patient’s side biometric module.
  + If the patient is away from the bed for more than 10 minutes, an alert will be sent to the caregiver.
  + If the patient touches the emergency capacitive sensor, an immediate signal will be sent to the caregiver.

Expected Outcomes:

* Continuous, real-time patient monitoring.
* Automated emergency alerts for quick response.
* A web-based dashboard for remote access to patient vitals.
* Improved safety and timely interventions for at-risk patients.
* Enhanced mobility tracking and emergency assistance features.

Conclusion:

The Smart Patient Monitoring System leverages IoT technology to provide real-time health tracking, emergency alerting, and remote access to vital signs. By integrating a wearable wristband and a side biometric module with additional alerting features, this system enhances medical response efficiency. It ensures proactive healthcare management and timely medical interventions, improving patient safety and comfort.

Note: The system components have been selected to ensure feasibility for a tabletop prototype. Further modifications may be made based on testing and implementation feedback.

**Required Components and Procurement Details:**

**Components Available in Lab:**

* **ESP32 Microcontroller** (Quantity: 2)
* **Infrared and Ultrasonic Sensor**
* **Buzzer**
* **LEDs and Connecting Wires**
* **2 Breadboard**
* **PCB**
* **Resistors**
* **Rechargeable Battery** (if available in the lab, otherwise needs to be ordered) / **Non-Rechargeable will also work.**

**Components to be Ordered:**

1. **Temperature Sensor - DS18B20**
   * **Main Link:** [DS18B20 Sensor Module - Robu](https://robu.in/product/ds18b20-temperature-sensor-module/)
   * **Alternate Link:** [DS18B20 Sensor Module - Robocraze](https://robocraze.com/products/ds18b20-digital-temperature-sensor-module?variant=44706682667232&country=IN&currency=INR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&campaignid=21579966654&adgroupid=&keyword=&device=c&gad_source=1&gclid=Cj0KCQiAz6q-BhCfARIsAOezPxnCwDAv-imHW3dp2MLAhXwbmYOiCyt1Yhxc-VAbAhXoSZUsVdKIFF0aAi4zEALw_wcB)
2. **SIM800L GPRS GSM Module**
   * **Main Link:** [SIM800L Module - Robu](https://robu.in/product/small-sim800l-gprs-gsm-module-micro-sim-card-core-board-quad-band-ttl-serial-port-antenna/)
   * **Alternate Link:** [SIM800L Module - Robocraze](https://robocraze.com/products/sim-800l-gsm-gprs-module?variant=40193244725401&country=IN&currency=INR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&campaignid=20685484537&adgroupid=&keyword=&device=c&gad_source=4&gclid=Cj0KCQiAz6q-BhCfARIsAOezPxnbCsXdZs_5QMq4KcWV5rfbdGrm32_22gjDEZC6ELtO4Ac0PuEfkP8aAlLBEALw_wcB)
3. **MAX30102 SENSOR**
   * **Main Link:** [MAX30102 Sensor - Robocraze](https://robocraze.com/products/max30102-pulse-oximeter-heart-rate-sensor-module?variant=40600368611481&country=IN&currency=INR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&campaignid=20685484537&adgroupid=&keyword=&device=c&gad_source=1&gclid=Cj0KCQiAz6q-BhCfARIsAOezPxmg6fShg71PJFLF_dP8-m55jmjsJ6E6dhqWR_Qjd3B4Guaplf5kxXkaAvseEALw_wcB)
   * **Alternate Link:** [MAX30102 Sensor - Robu](https://robu.in/product/max30102-heart-rate-and-pulse-oximeter-sensor-module-black/?gad_source=1&gclid=Cj0KCQiAz6q-BhCfARIsAOezPxm1ihZS6iXi4SMYe8otdzhQLrHDiRuygfSumS8sCaahcEoBUAnGVJkaAjr3EALw_wcB)
4. **MQ135 SENSOR**
   * **Main Link:** [MQ135 sensor Robu](https://robu.in/product/mq-135-air-quality-gas-detector-sensor-module-for-arduino/?gad_source=1&gclid=Cj0KCQiAz6q-BhCfARIsAOezPxman8MMOuP1EcbfVFJHRN2xhCr31boRHvXNj9XbwoCx_-xjv076ibAaAvseEALw_wcB)
   * **Alternate Link:** [MQ135 sensor - quartz component](https://quartzcomponents.com/products/mq-135-air-quality-gas-sensor-module?variant=31897785925767&country=IN&currency=INR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic?utm_source=google&utm_medium=FreeListings&gad_source=1&gclid=Cj0KCQiAz6q-BhCfARIsAOezPxlx6i0KPP5E4-wHiZT_HVAGDthsg0yAFGFyZMWMR7LaGU6-w27SEdcaAsicEALw_wcB)  
       
     **(If the above sensors(or equivalent) are already present in the lab then kindly provide them)**