

**Team: 014**

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## Problem Statement

Current healthcare monitoring for at-risk individuals lacks integration, real-time analysis, and emergency features for multiple individuals simultaneously. Our project introduces a smart healthcare wearable that combines vital signs monitoring, fall detection, and SOS alerts. Integrated with user-friendly mobile and dashboard apps, it offers real-time data analysis, enhancing patient safety and empowering healthcare providers.

## Constraints

- Wi-Fi Signal Dependency: The prototype relies on Wi-Fi to upload collected data to the cloud
- Limited Resources: Due to the unavailability of certain components, both battery capacity and computational power are limited.
- Timeframe Restriction: Prototype is bounded by a 14-week completion deadline

## Specifications

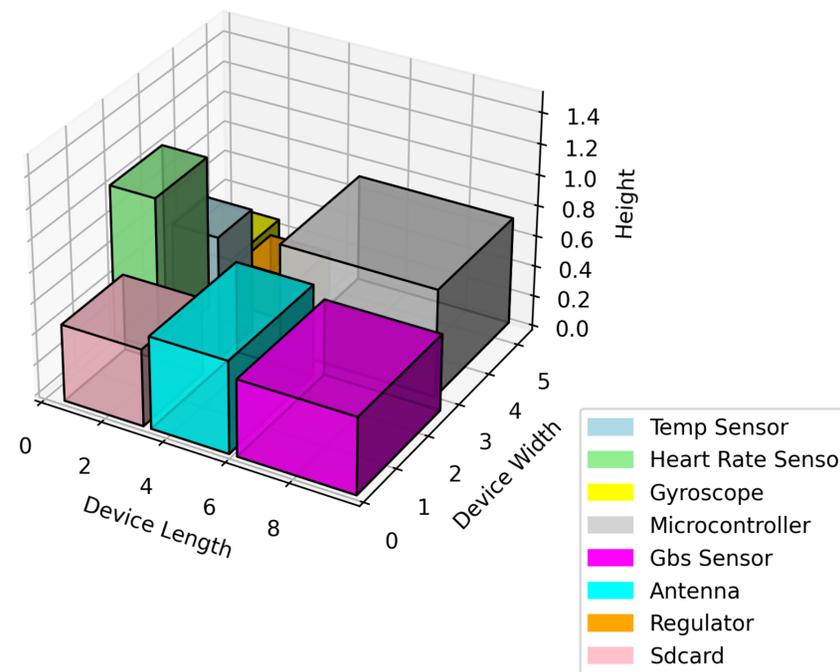
1. Heart Rate Accuracy in BPM:  $\pm 5\text{BPM}$
2. Body Temperature Accuracy In Celsius:  $\pm 0.5^\circ\text{C}$
3. SD Card Capacity in GB  $\geq 16\text{GB}$
4. Data Transmission Every 10 minutes
5. Emergency Response Time in Seconds  $< 5$  seconds
6. Fall Detection Accuracy Rate  $\geq 80\%$
7. Dimensions in  $\text{cm}^3 \leq 140 \text{cm}^3$

## Project Impact

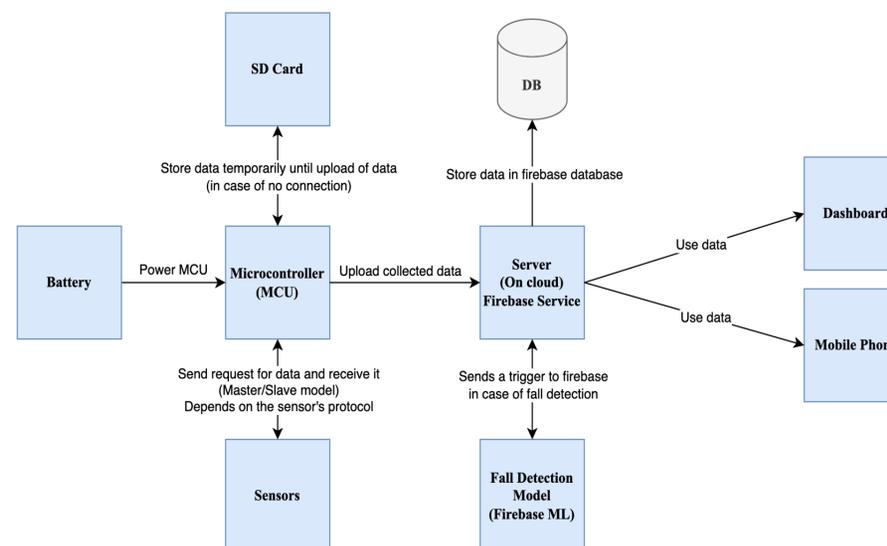
The project positively impacts the public health sector by providing a method to monitor a large number of patients simultaneously, improving safety and well-being in hospitals, nursing homes, and for individual users who use this product at home.

## Prototype Design

3D Component Layout on Device



**Figure 1:** 3D Layout of Components in IoT Device



**Figure 2:** Conceptual System Design Diagram

## Testing and Validation

Specification Number	How and Why
Specifications No. 1-3	All components purchased have been tested to ensure accuracy and meet specifications.
Specifications No. 4-5	Specification No. 4 involves periodic data transmission, implemented via timed code. Specification No. 5 concerns the system's response time; in testing, the worst-case scenario was recorded at 4.97 seconds.
Specification No. 6	No.6 is the fall detection model which was tested on the validation set and new data and scored an accuracy of 92%
Specification No.7	No.7 is related to the dimensions of the device. Proof is shown in Figure 1

## Conclusion

Our project successfully developed an integrated smart healthcare wearable for elderly individuals, meeting stringent specifications despite limitations like Wi-Fi dependency and computational constraints. The prototype not only accurately monitors vital signs and detects falls with high precision but also ensures rapid emergency responses. This device represents a significant step forward in enhancing elderly care through technology, promising improved safety and greater autonomy for at-risk populations.