



# SenseAhead Smart Shirt: Wearable Vital Sign Monitoring for Occupational Health and Safety

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## Problem Statement

Major risks from labor intensive jobs:

- heat stress
- cardiovascular strain
- respiratory distress

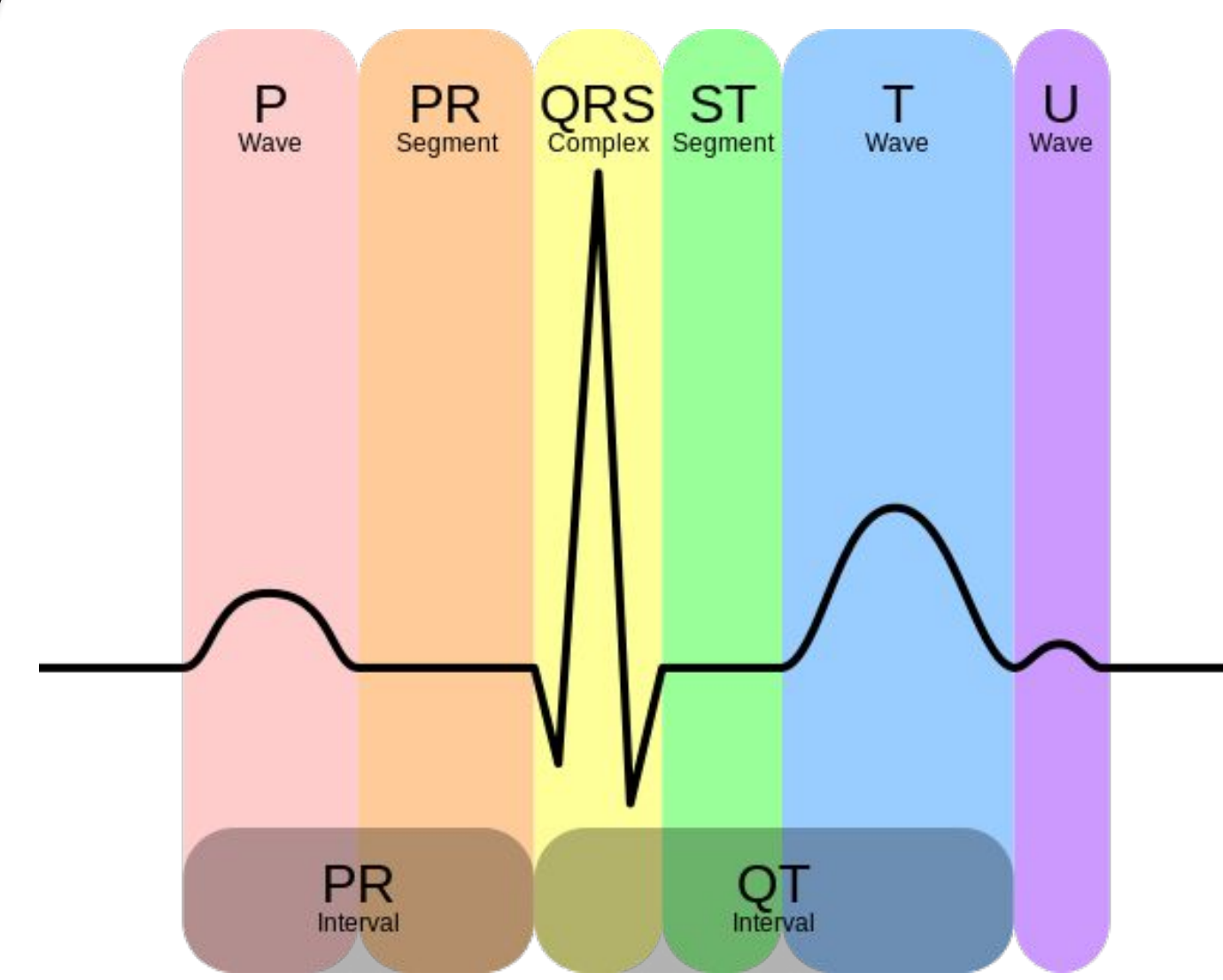
Continuous health monitoring:

- Early detection
- Occupational safety
- Reduction in long-term health consequences
- Reduced ED visits



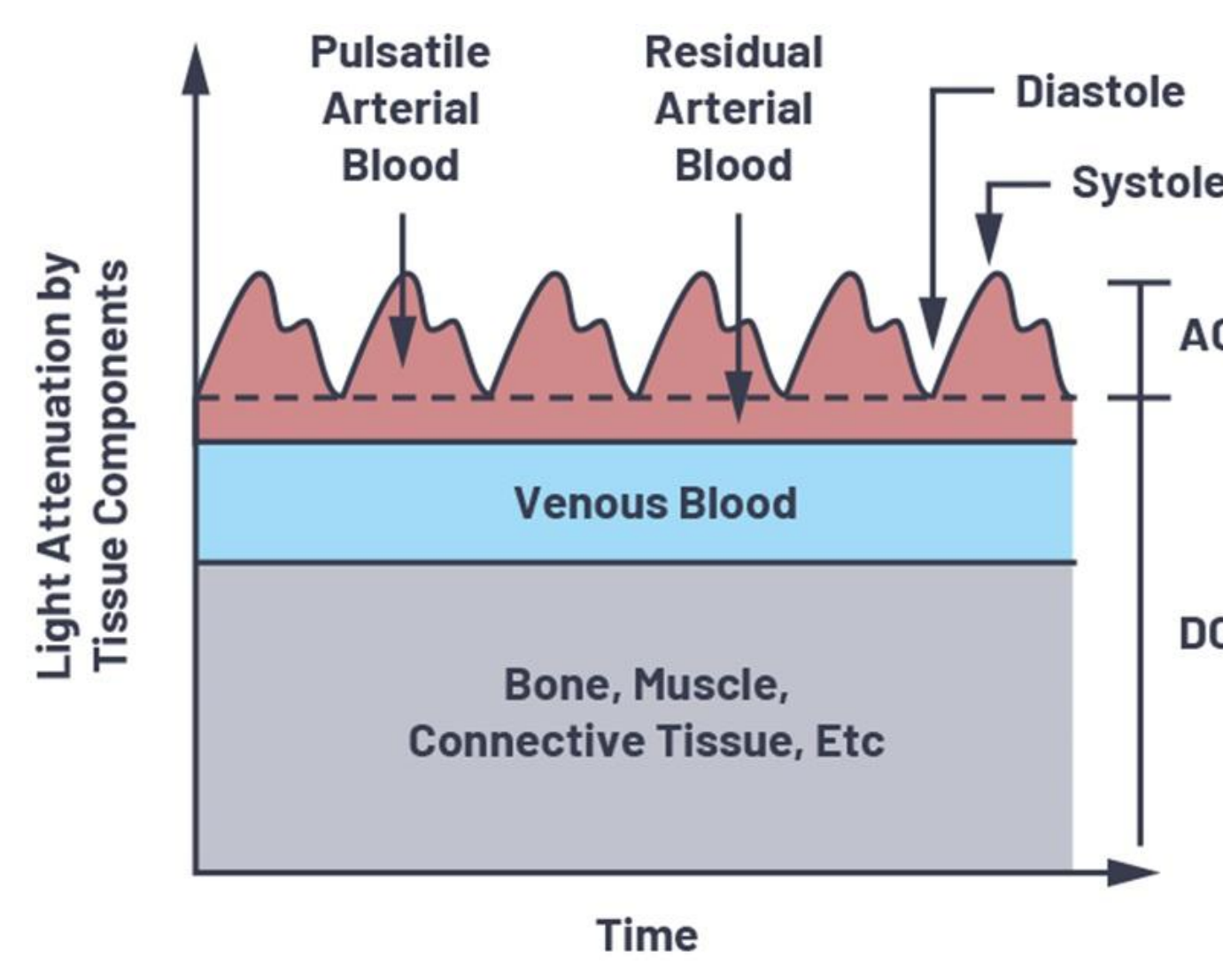
**~120,000 HRI**  
in 2023 [1]

## Critical Vital Signs



### Heart Rate

- Normal: 60–99 bpm
- Abnormal: <60 bpm or >99 bpm at rest
- Risky: >77% Target HR [2]



### SpO2

- Normal: 98–100%
- Decreased: 90–94%
- Low: <90%
- Severe Hypoxia: <80%
- Life threatening: <70% [3]

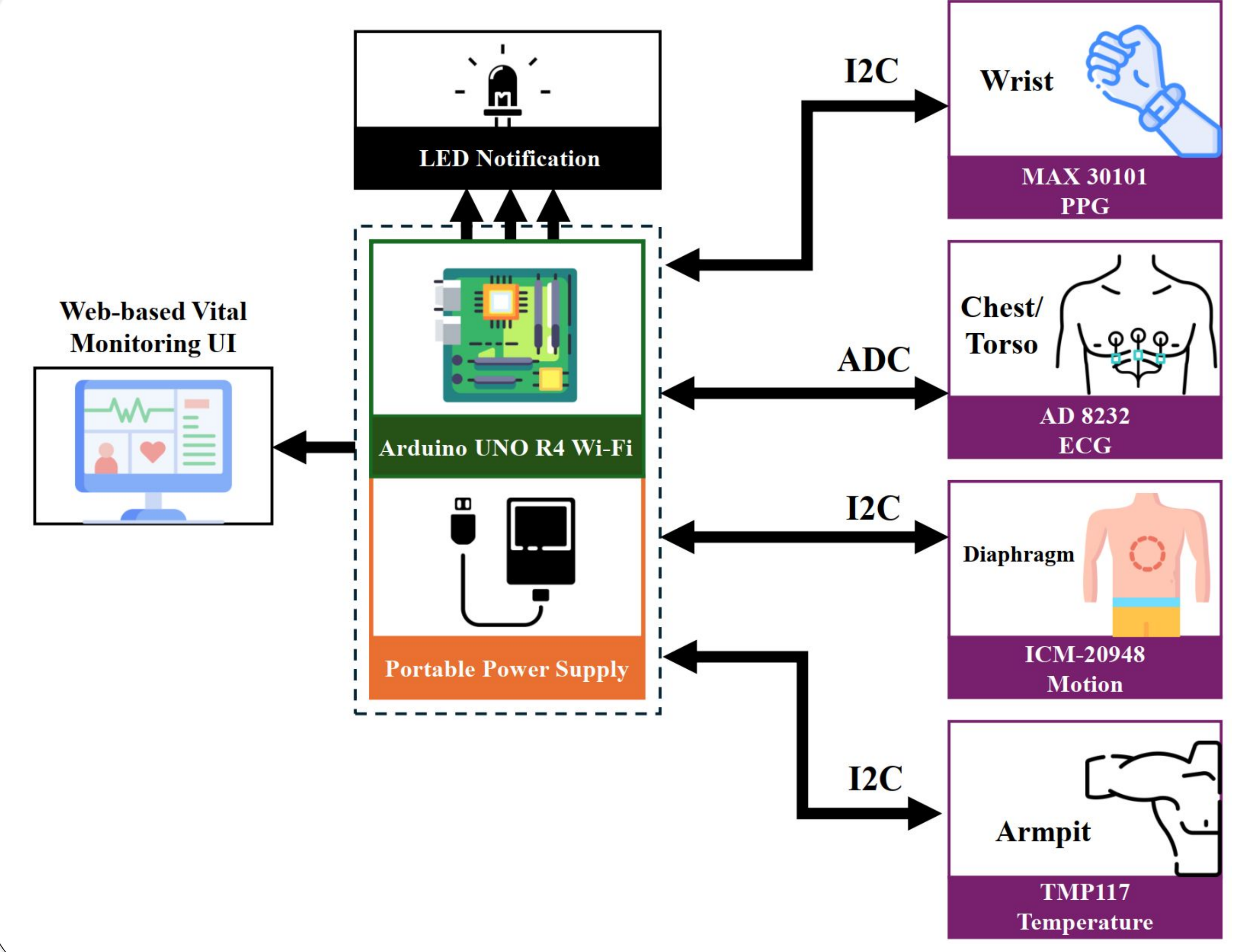
### Temperature

- Normal: 97F - 99F
- Fever: >99F
- Heat Stroke: > 104F [4]

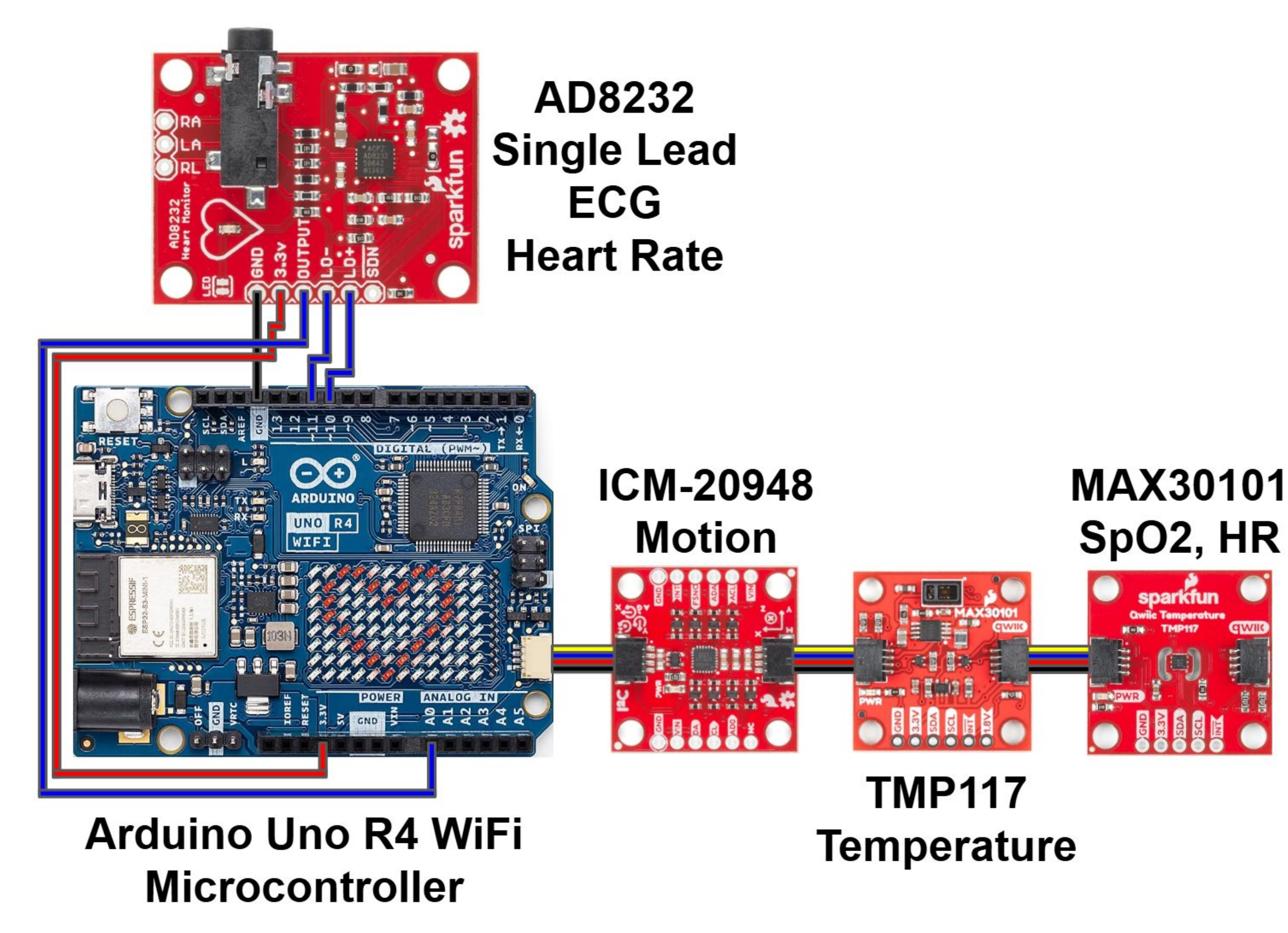
## References

- 1) Vaidyanathan, Ambarish, et al. "Heat-Related Emergency Department Visits — United States, May–September 2023." Morbidity and Mortality Weekly Report, vol. 73, no. 15, 18 Apr. 2024, pp. 324–329. www.cdc.gov/mmwr/volumes/73/wr/mm7315a1.htm?s\_cid=mm7315a1\_w. https://doi.org/10.15585/mmwr.mm7315a1. Accessed Sept 10, 2025.
- 2) T. W. Son, D. A. Ramli, and A. A. Aziz, "Wearable Heat Stroke Detection System in IoT-based Environment," Procedia Computer Science, vol. 192, pp. 3686–3695, 2021, doi: <https://doi.org/10.1016/j.procs.2021.09.142>.
- 3) R. Finnerty, "How to Design a Better Pulse Oximeter | Analog Devices," Analog.com, 2024. <https://www.analog.com/en/resources/technical-articles/how-to-design-a-better-pulse-oximeter.html>
- 4) Felson, Sabrina. "What Is Normal Body Temperature?" WebMD, 22 Mar. 2017, www.webmd.com/first-aid/normal-body-temperature. Accessed 10 Sept. 2025.

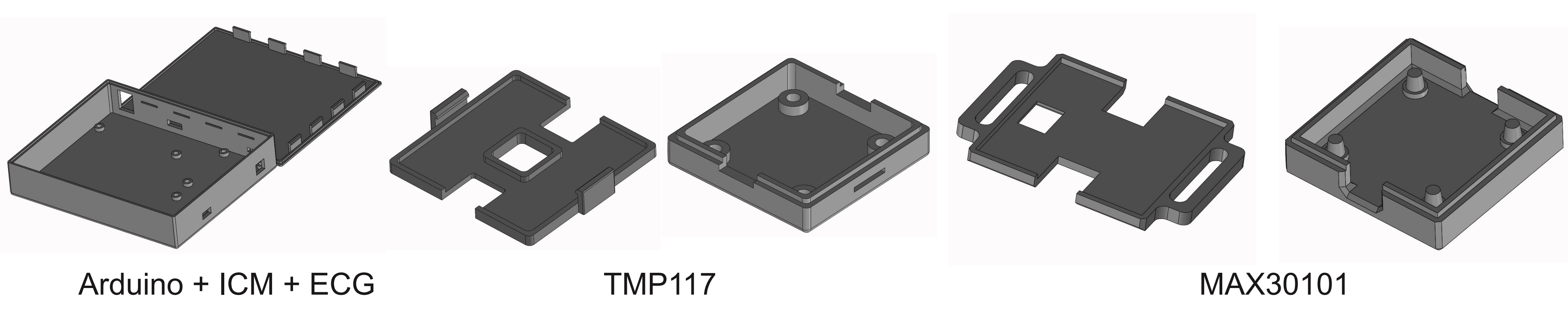
## Our Framework



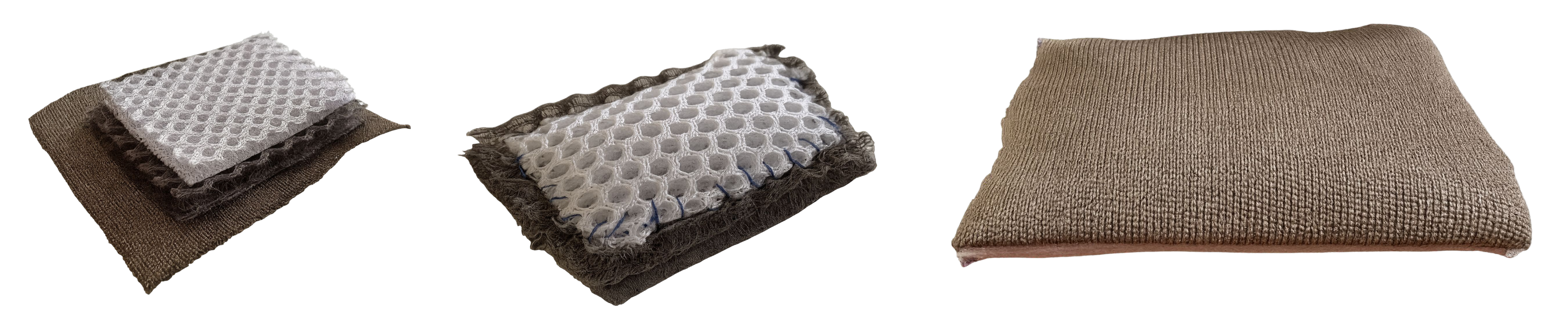
## Device & Sensor Usage



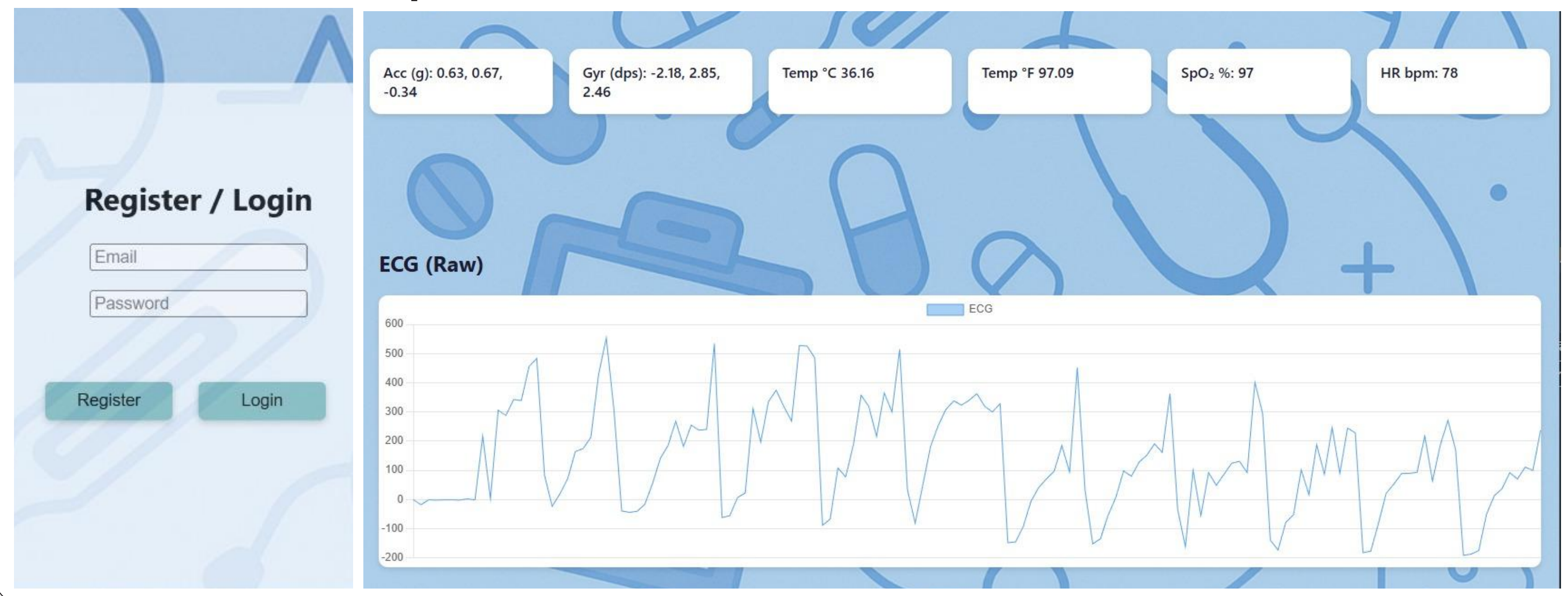
## Enclosure & CAD Design



## Dry Electrode Fabrication



## Real Time Updates



## Final Product



## Analysis of Collected Data

