

# Wear Care

Stop Blood Clots before They Stop You

# Real-Time Blood Flow Monitoring

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## Background

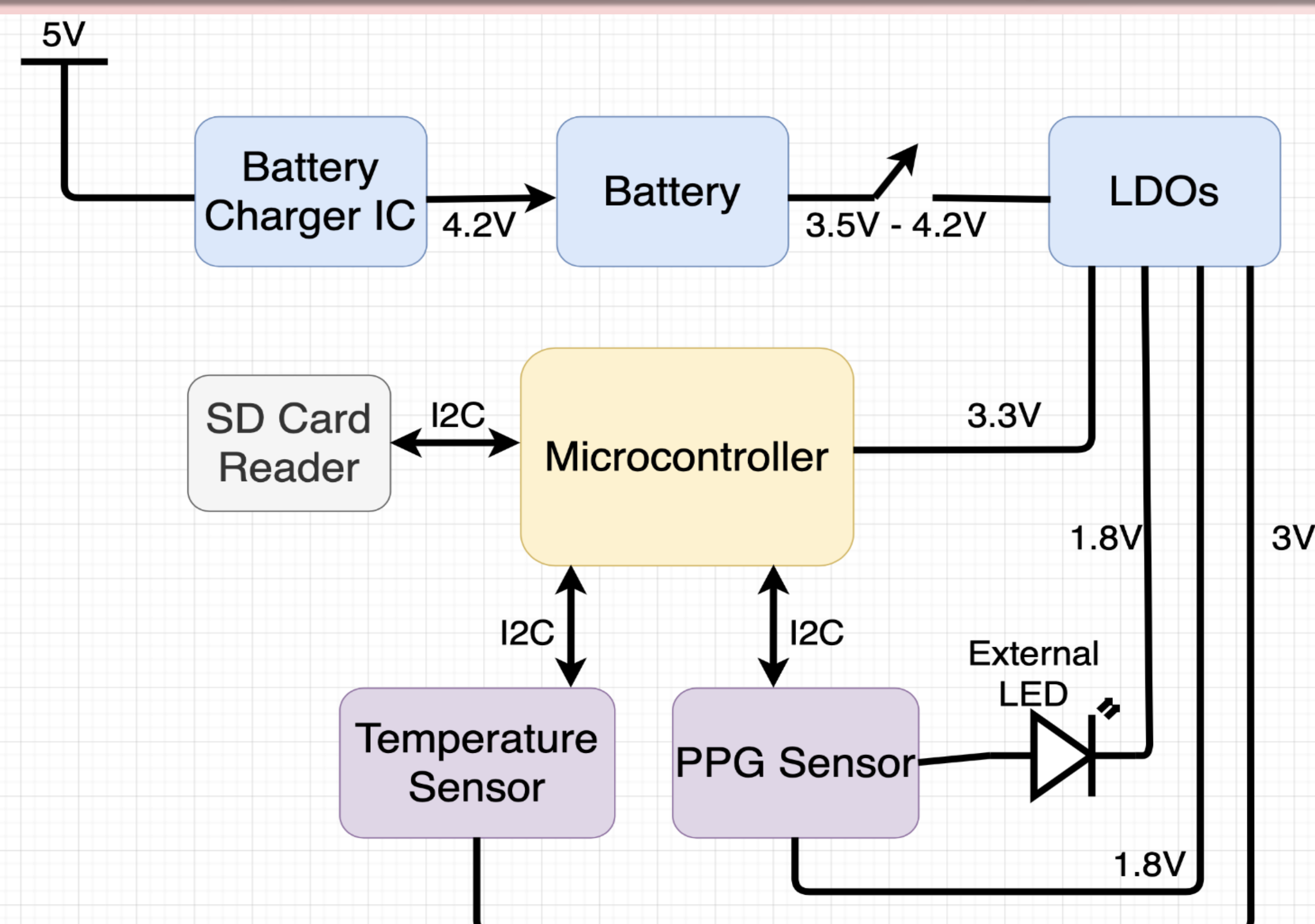
Deep Vein Thrombosis occurs when a blood clot forms in a deep vein as a result of blood that moves too slowly. Current methods of treating DVT are reactive. We took a proactive approach in preventing DVT in high risk individuals: using photoplethysmography, a non-invasive technique that measures the fluctuations of blood volume in a given region. The ultimate goal is to infer from the processed data if a blood clot is imminent. We mainly focus on developing the necessary hardware and software to reproduce and validate this technique.

## Overview

Our product is a wearable blood flow monitoring device designed for researchers to validate and test popular non-invasive blood flow monitoring techniques with PPG.

- Battery powered
- SD card storage capability
- Tethered real-time monitoring
- Smart layout for versatile sensor configurations
- Open-source EAGLE library to design custom sensor boards.

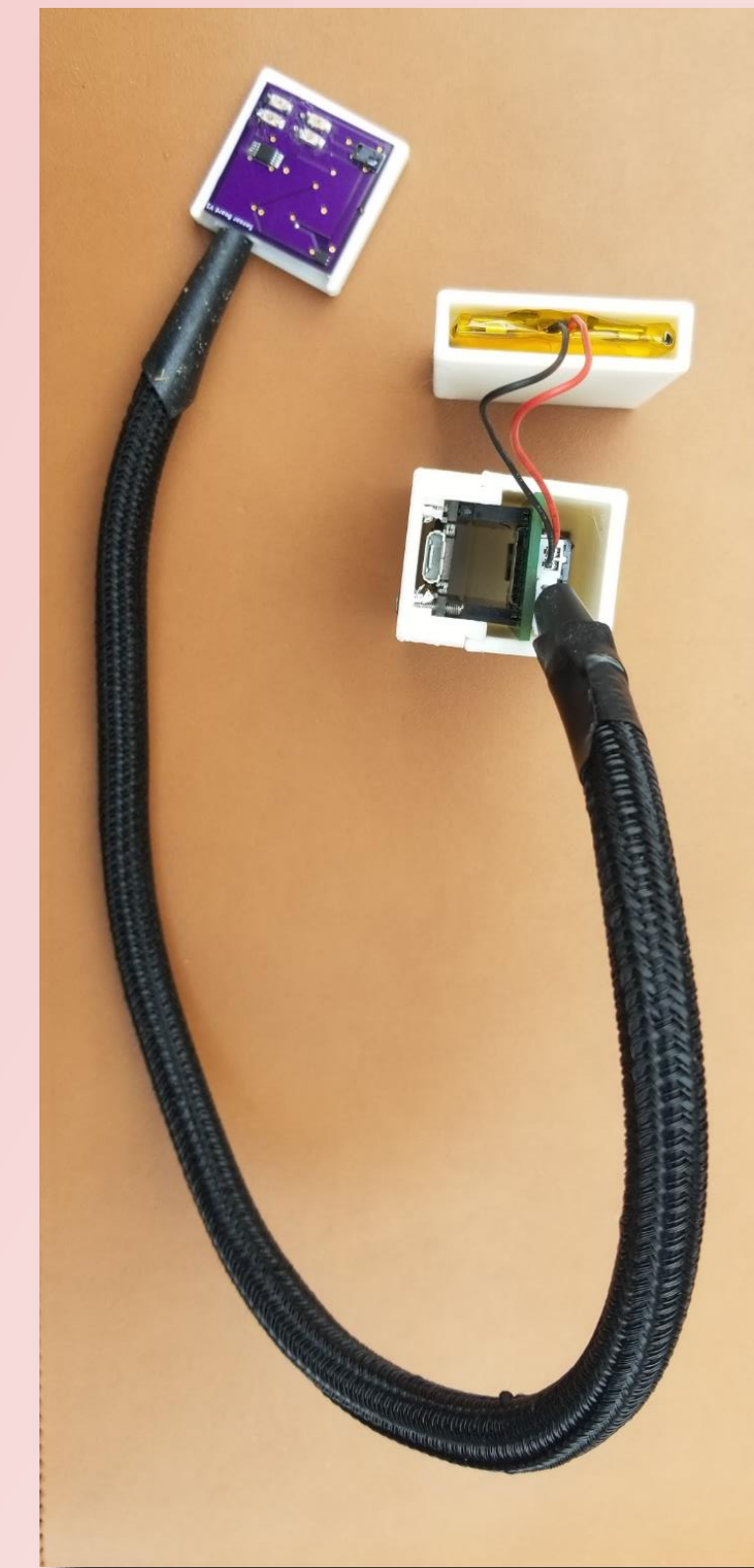
## High Level Block Diagram



## Final Design



a) Sock-style design

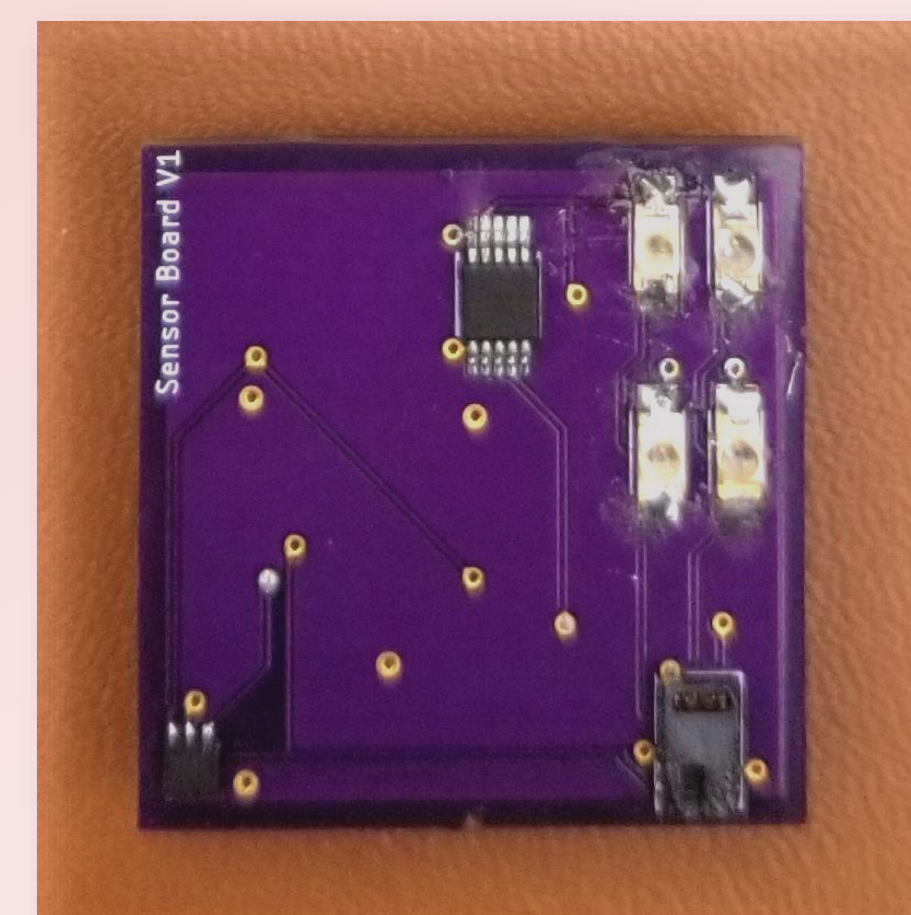


b) Device



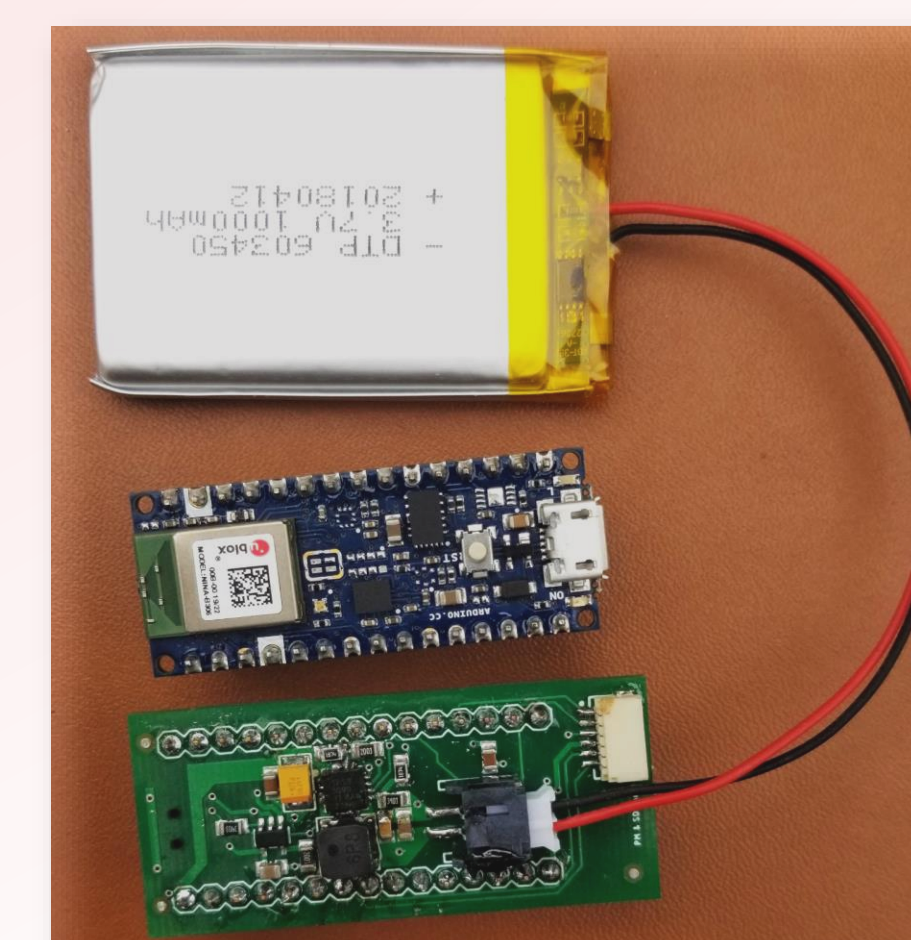
c) Velcro-strap design

## Key Components



### Sensor Board

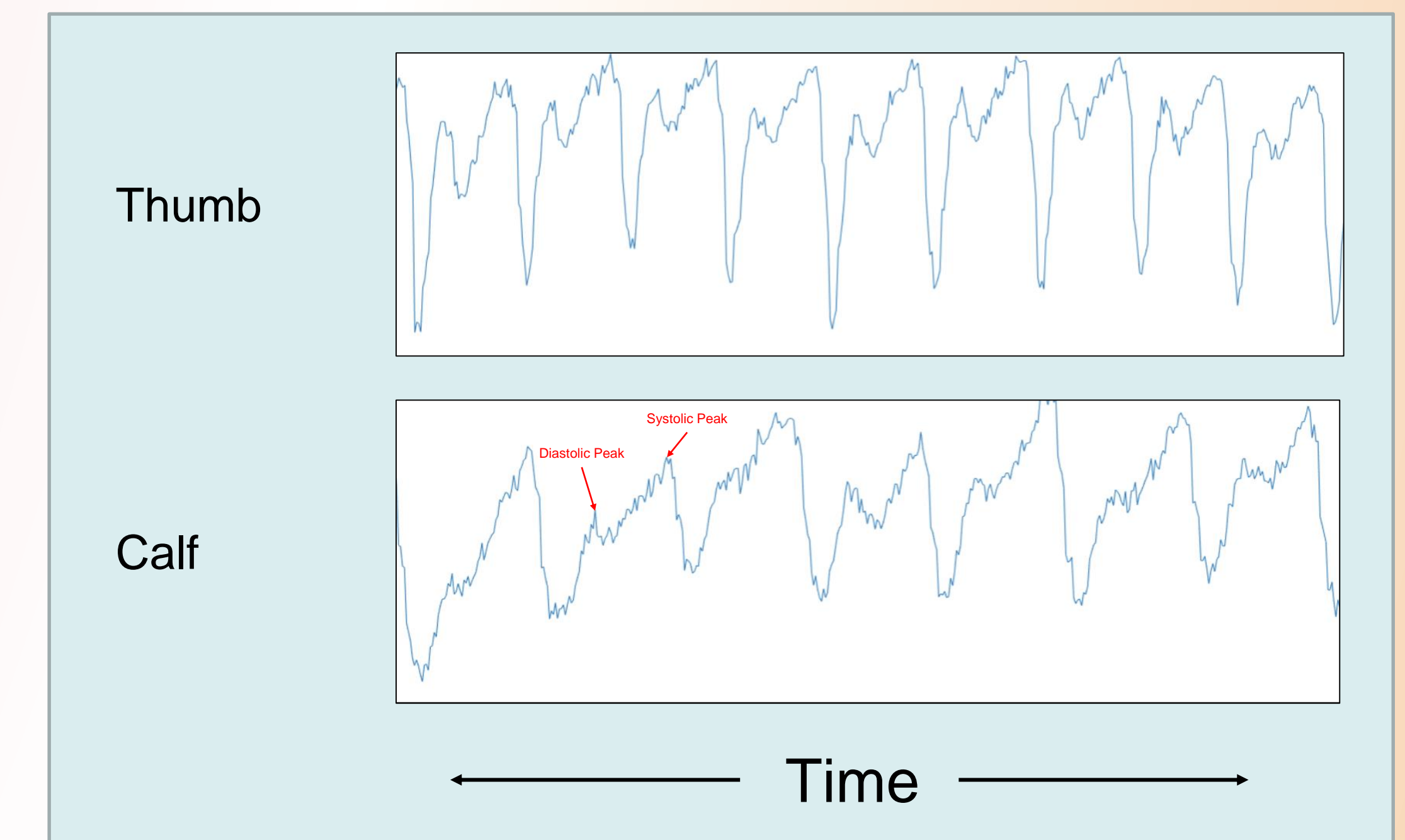
- Temperature sensor
- 4 photodetectors
- 3 pairs of 660 and 880 nm wavelength LEDs at different photodetector distances.



### Main Processing Board

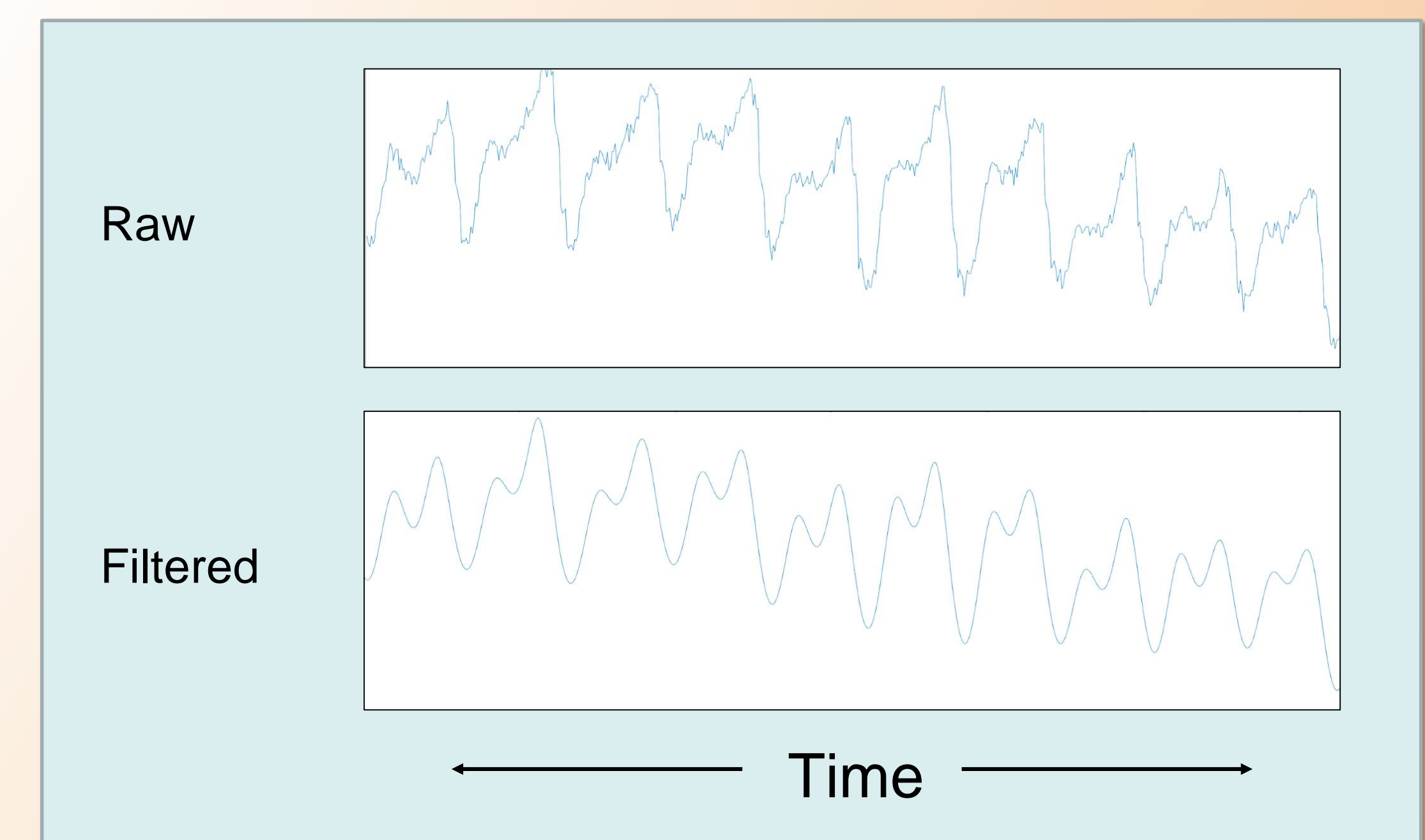
- Arduino microcontroller
- On-board accelerometer and gyroscope sensors
- Battery management
- SD card interface

## PPG signal from thumb and calf



- Data collected from both thumb and calf resembles expected PPG signal shape.

## Filtering PPG signal



- Low-pass filtering is performed on the PPG signal acquired from the upper calf in order to eliminate noise.

## Future Work

- Implement sophisticated signal processing algorithms in order to validate blood flow tracking techniques with on-board sensors
- Build smartphone application to interface over bluetooth

## Acknowledgements:

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