

Build Team: Pulse Oximeter

Project Managers: Aaron Li, Allison Cheng, Andrew Tran, James Fu

Biomedical Engineering Society at UCLA

2023-2024 Team Members: Alexis Raquino, Alinur Sayat, Anusha Lingampally, Caleb Liow, Dana Nguyen, Deanna Pham, Ellen Zulkarnain, Ena Pejovski, Gauri Arora, Hannah Yared, Ilinca Flacau, Joanna Rhim, Kylee Narasaki, Kyra Sunil, Landon Hiley, Melanie Salas Quintana, Natalie McDonnell, Nicole Ershaghi, Saaraa Danish, Sophia Welsh, Teagan Carr, Vyas Koduvayur

Objective & Background

- To teach students fundamental engineering skills through a year-long introductory technical project
 - These skills are essential for industry, research, and upper division courses
- To equip students with the necessary experience to build a basic medical device
- Students have developed hands-on skills in:
 - Microcontrollers
 - Circuitry
 - C++ Coding
 - 3D CAD
 - PCB Design
 - Soldering
 - Troubleshooting/Prototyping

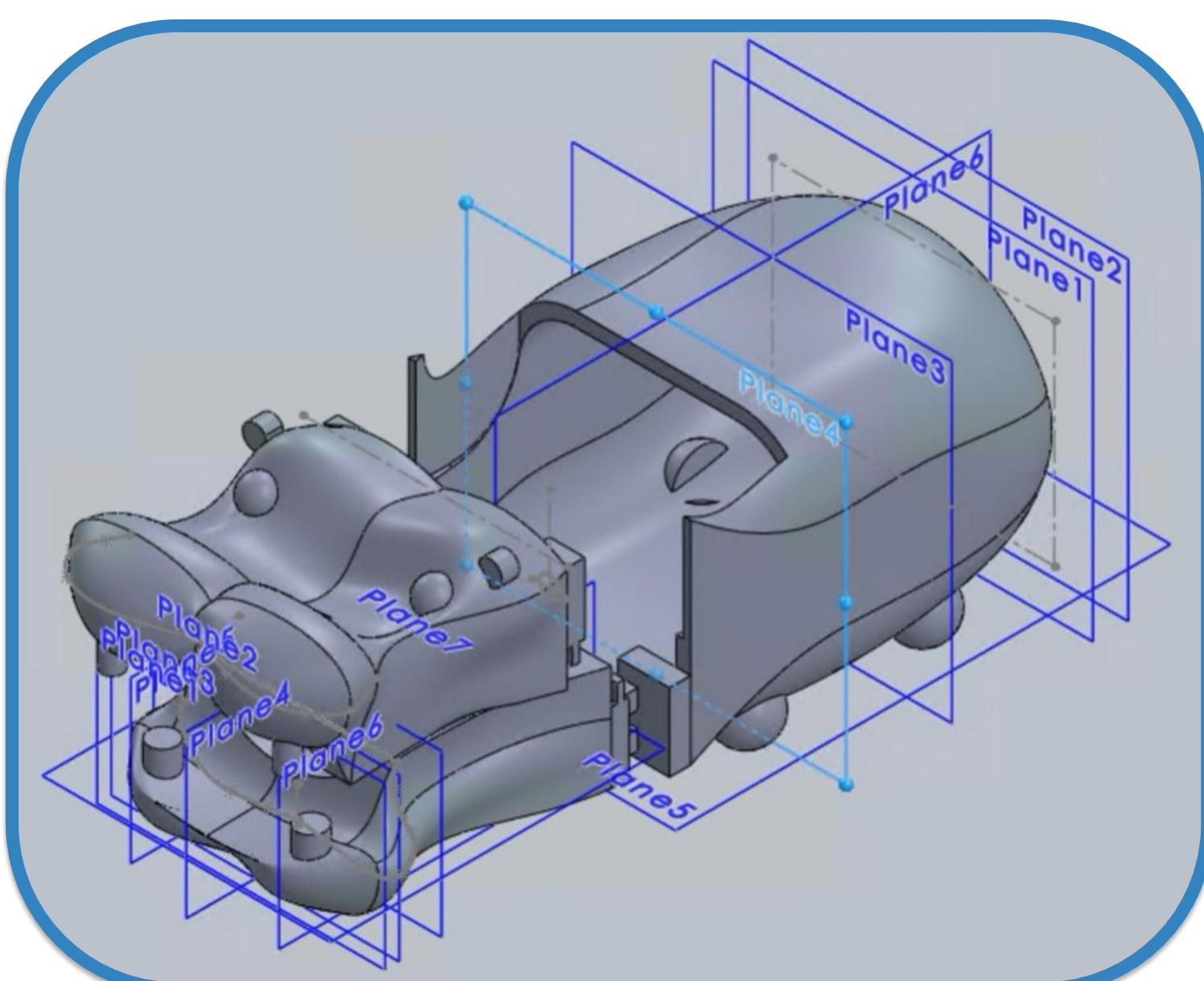


Computer-Aided Design

- Introduced basic concepts of CAD using Fusion 360
- Students created sketches, cuts, rotations, and extrusions to build a pulse oximeter finger clamp and casing for circuitry
- Designs were 3D printed



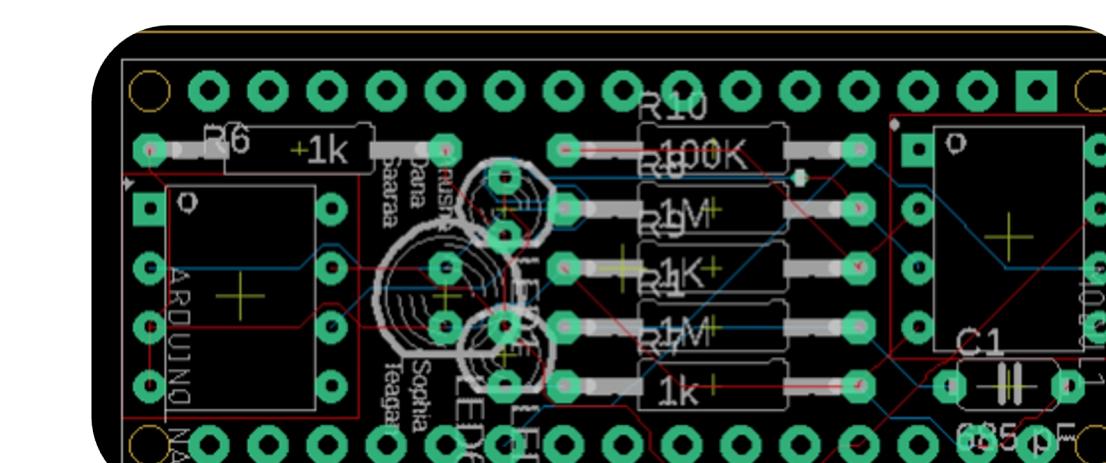
3D Printed Casing from Team 4
Ena, Ilinca, Nicole



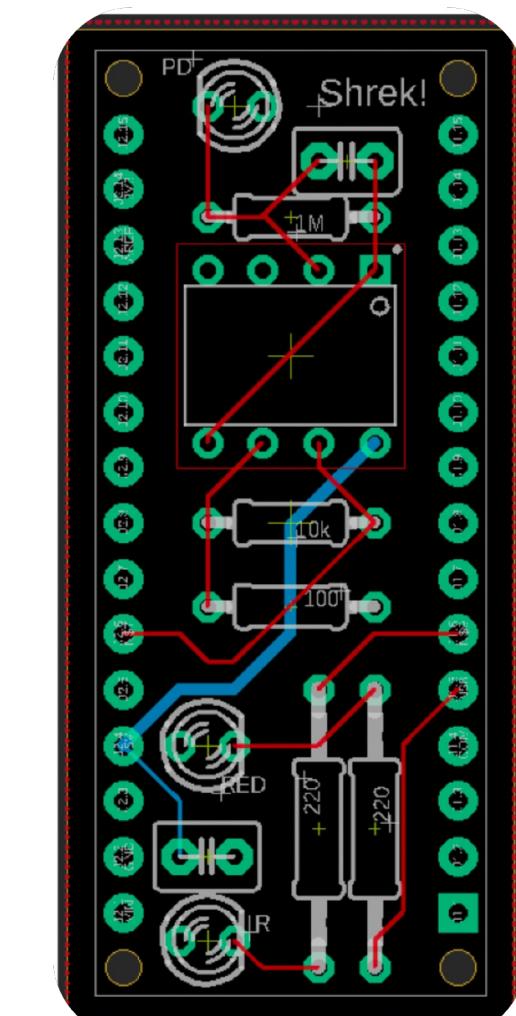
3D Model from Team 1
Vyas, Alinur, Melanie, Joanna

Printed Circuit Board

- Introduced basic concepts of printed circuit board design using Eagle
- Students learned how to create schematics, design boards, and solder



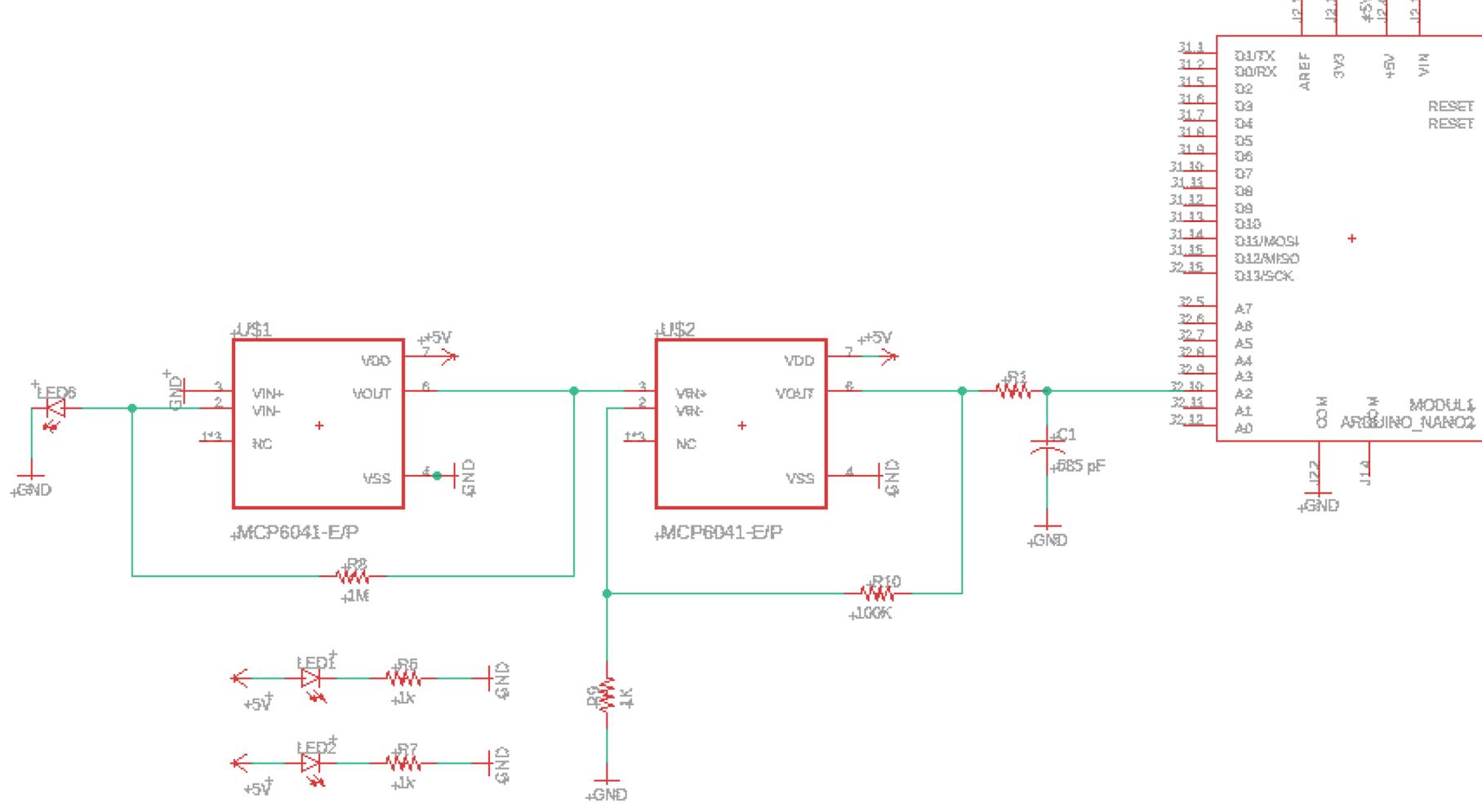
Board Design & PCB from Team 5
Anusha, Teagan, Dana, Sophia,
Saaraa



Board Design from Team 4
Ena, Ilinca, Nicole

Circuitry

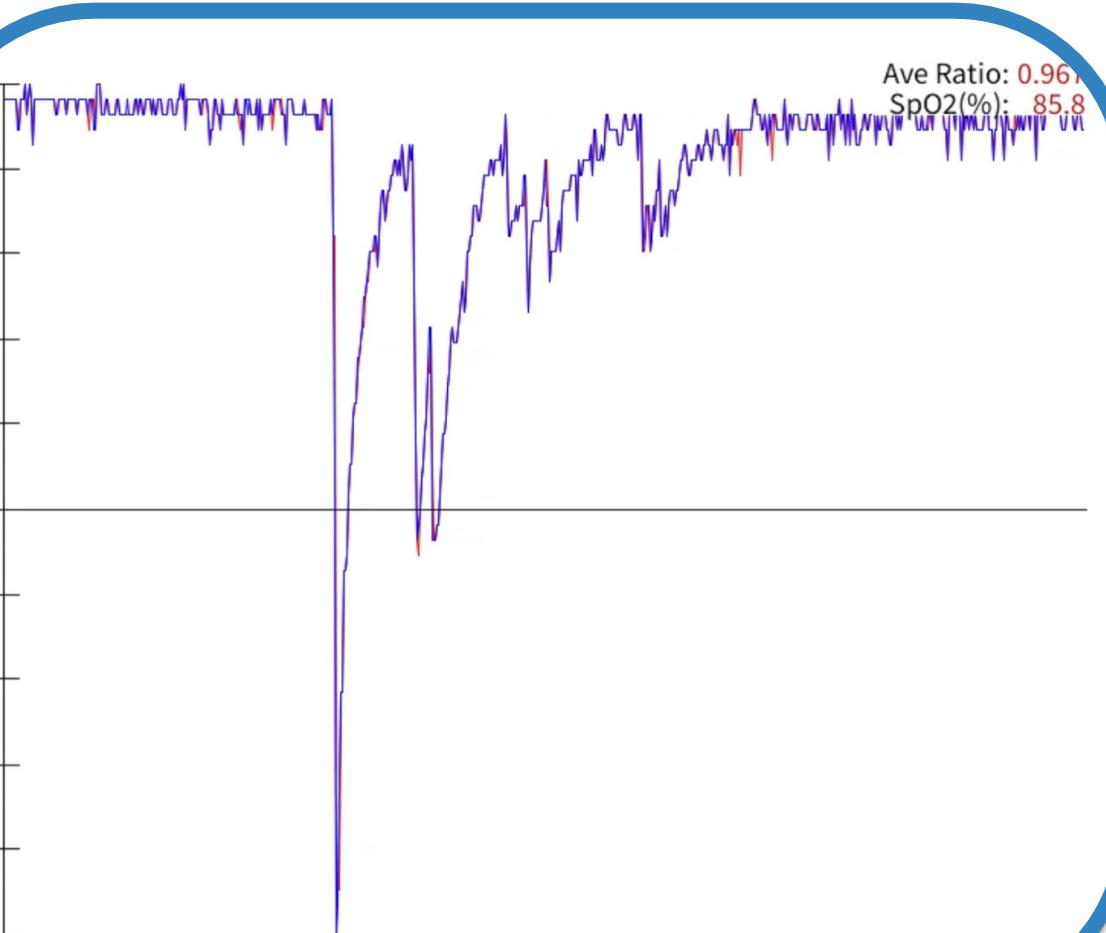
- Students learned basic circuitry, including Ohm's Law and Kirchhoff's Laws
- Students were introduced to advanced circuitry concepts, including operational amplifiers, low and high pass filters, and analog circuits
- In workshops, students applied theory to real-life projects and mastered prototyping on breadboards



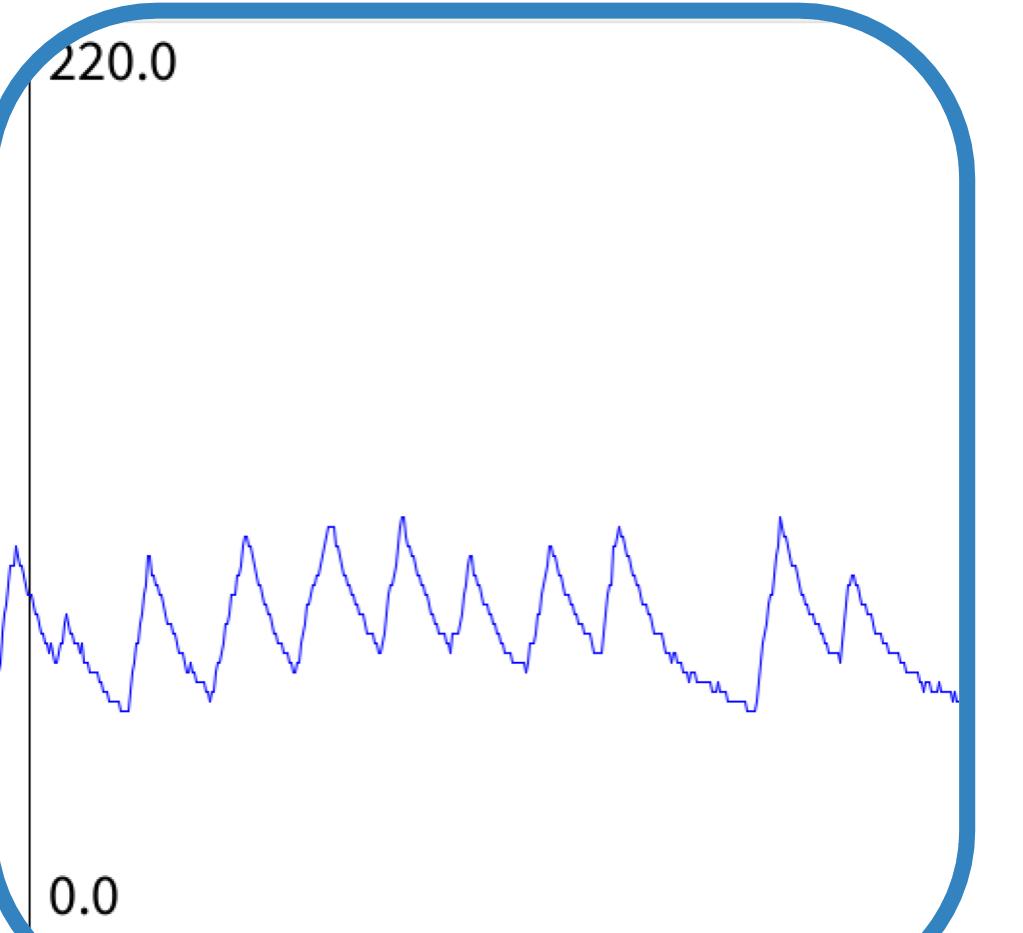
Circuit Schematic from Team 5
Anusha, Teagan, Dana, Sophia, Saaraa

Arduino & Processing

- Taught introductory microcontroller concepts such as digital and analog signaling in Arduino IDE
- Introduced fundamental coding concepts (C++/Java) including variables, loops, arrays, conditionals, and functions
- Students used Processing to write a program that plots and calculates pulse and oxygenation levels from the data captured with their device



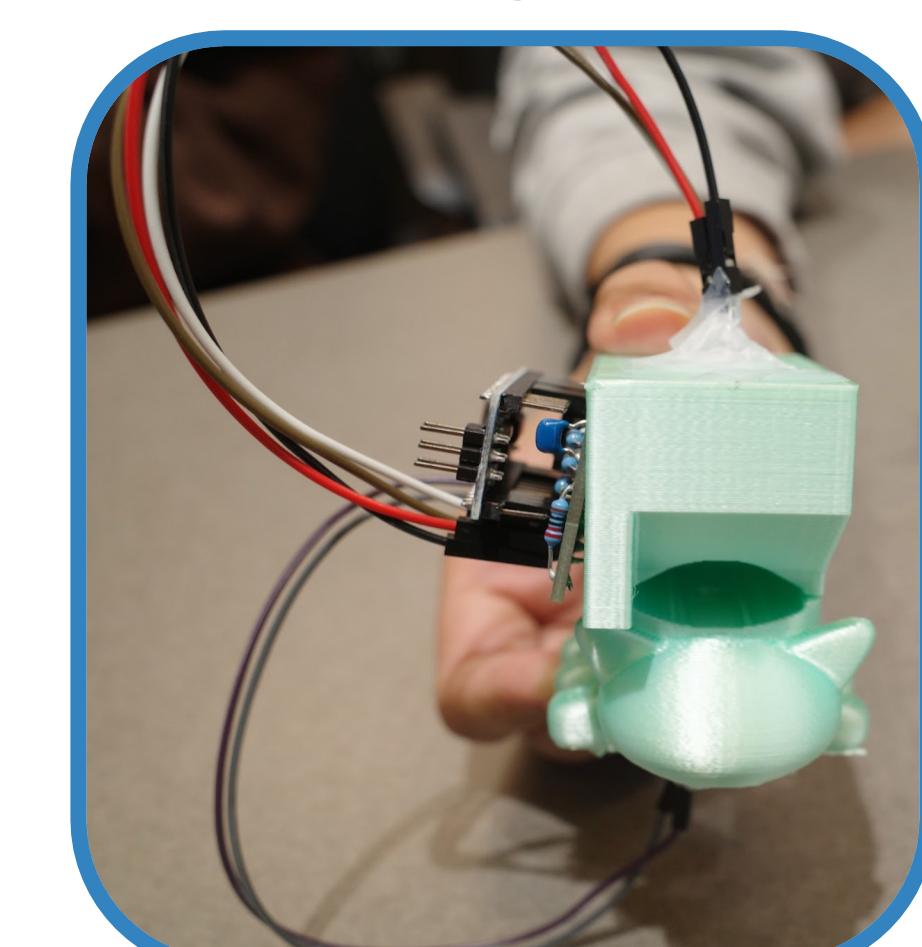
Processing Output from Team 7
Caleb, Landon



Pulse Signal from Team 2
Hannah, Ellen, Kyra

Complete Device

- Complete device integrates IR and red LEDs with operational amplifiers to calculate heart rate and blood oxygenation
- Program is controlled through Arduino and data is presented via Processing
- The casing and PCB form the physical device



Device from Team 3
Natalie, Kylee, Deanna, Gauri



Device from Team 2
Hannah, Ellen, Kyra

Acknowledgements

This project was funded by UCLA's Department of Bioengineering and the Engineering Alumni Association.

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