

Smart walker for clinical rehabilitation

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Milestone 2 Feedback



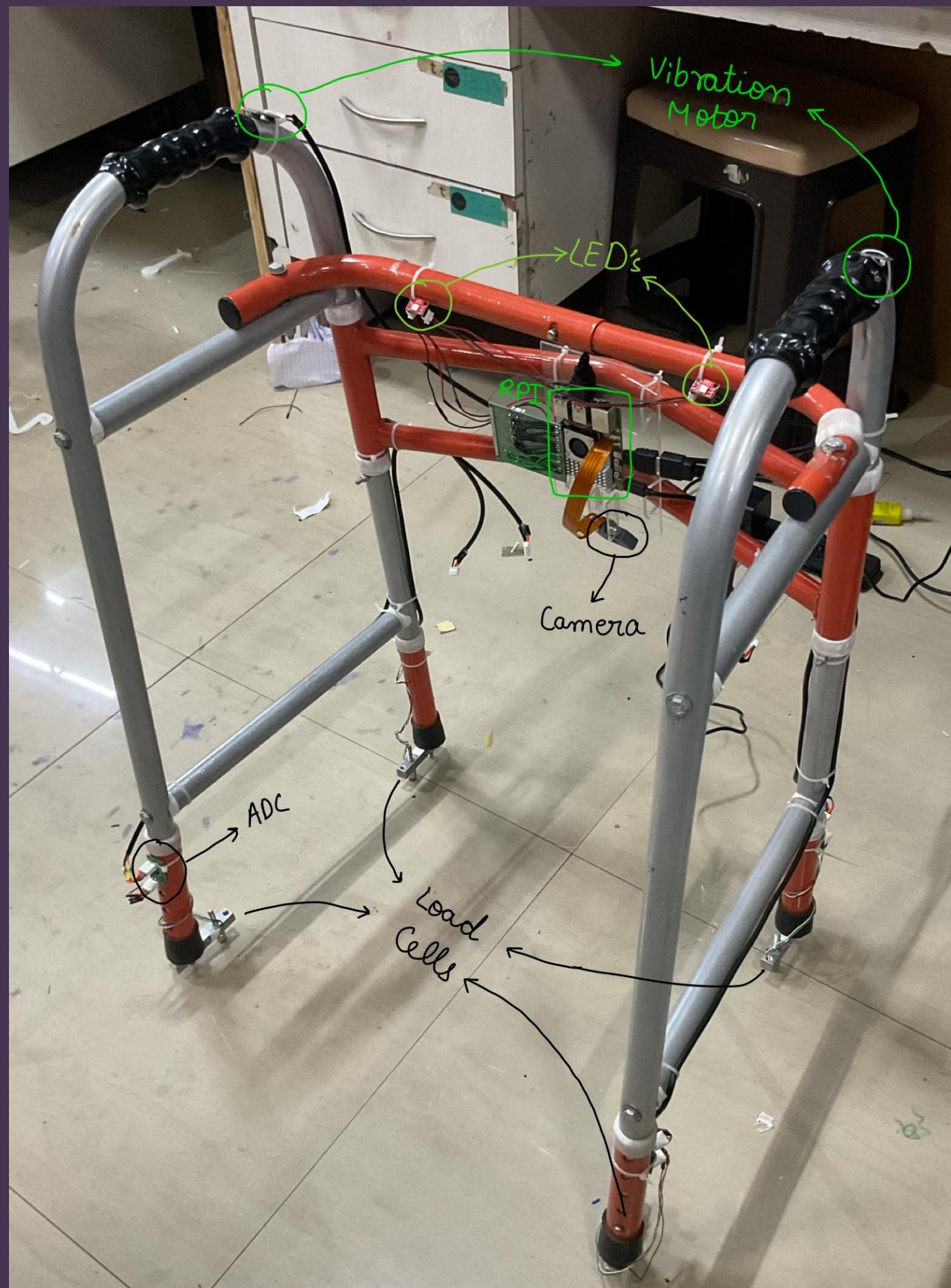
Feedbacks

Solutions

- | | |
|---|--|
| <ul style="list-style-type: none">● To use connector wires for easy replacement for different components. | <ul style="list-style-type: none">● For ADC, leds, vibration motors, we have used JST connector wires. |
| <ul style="list-style-type: none">● To use bluetooth for showing the camera feed and audio. | <ul style="list-style-type: none">● We have not reached that stage. |

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Overview



Overview:

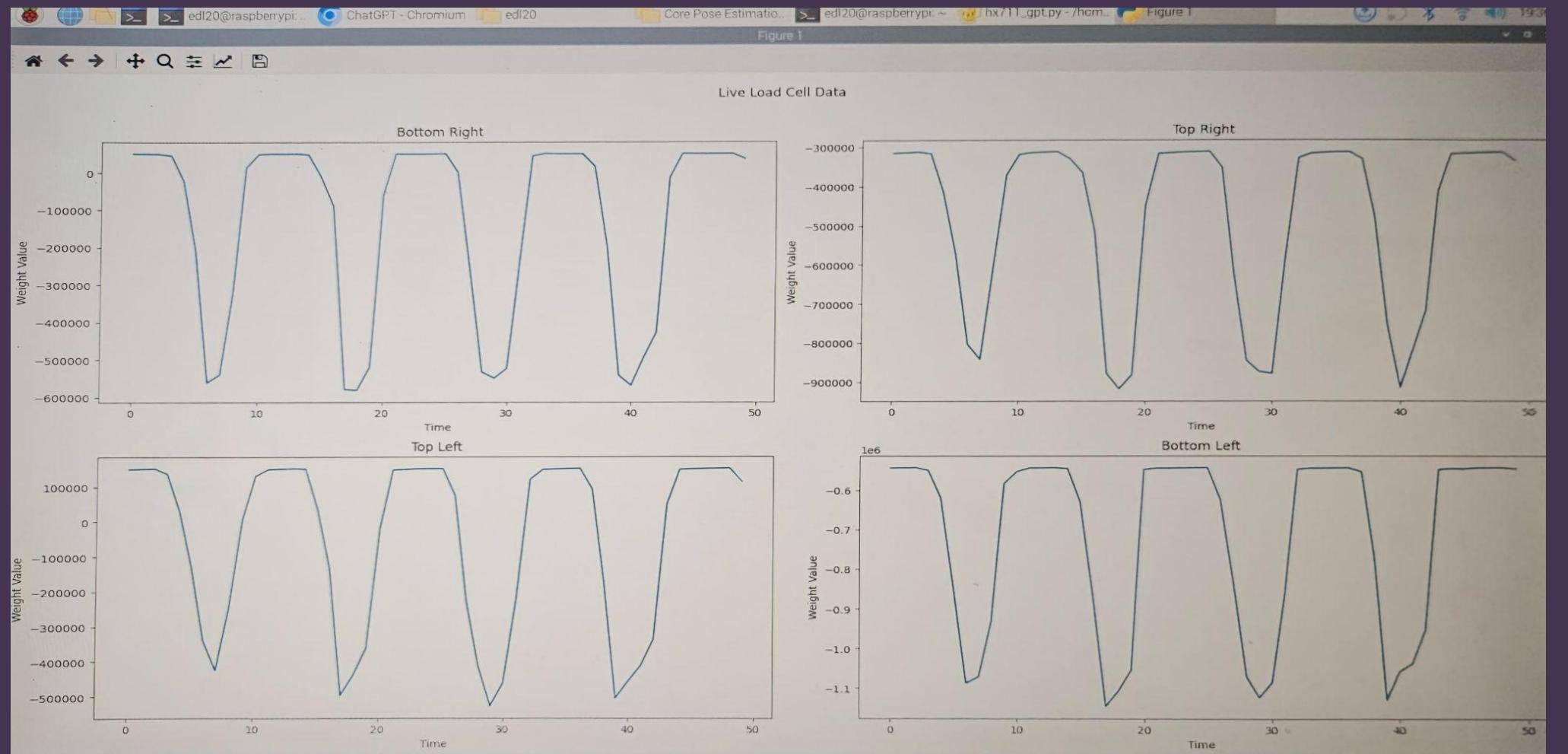
- **Component Assembly:** All components have been assembled except for the LCD screen for the user interface.
- **Temporary Display Setup:** Currently using a monitor to display the camera feed and audio. A standalone display will be used later for mounting on the walker.
- **Integration Status:** All individual components are functioning, but full system integration is still pending.
- **Pending Tasks:** Finalizing the PCB shield and completing the CAD design for the enclosure.

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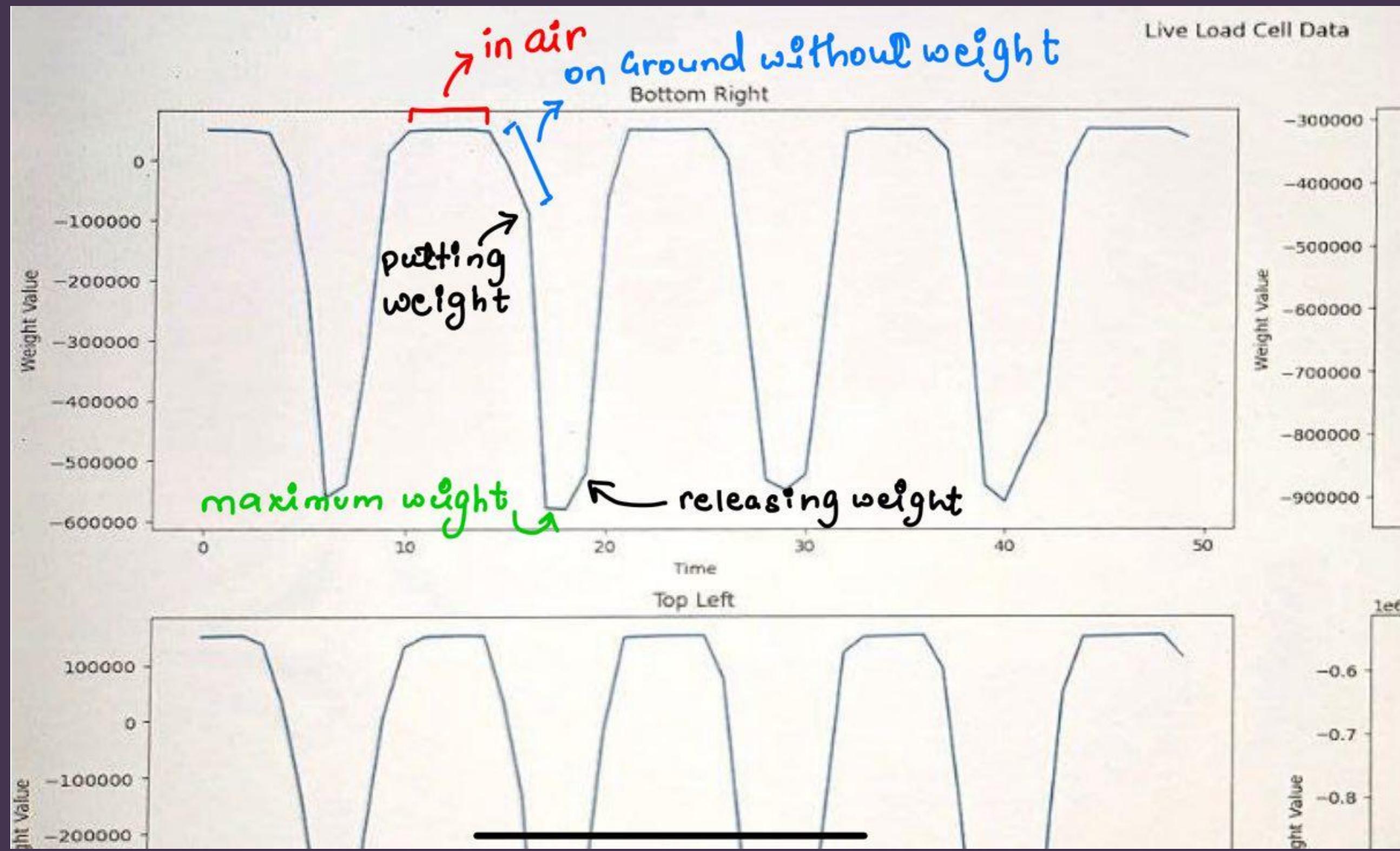
Proof of Concept

Load Sensor Working

- Load cell video

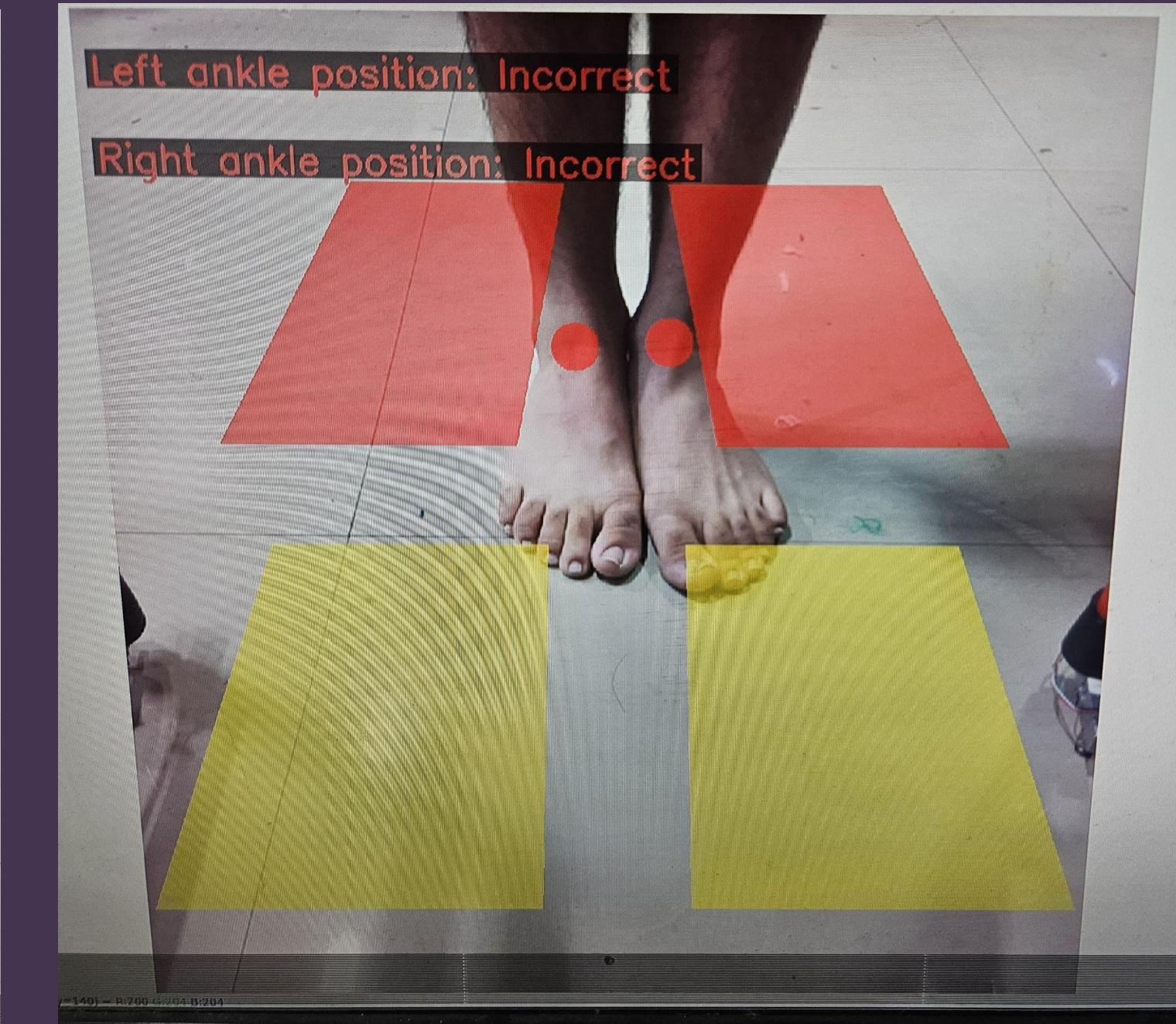
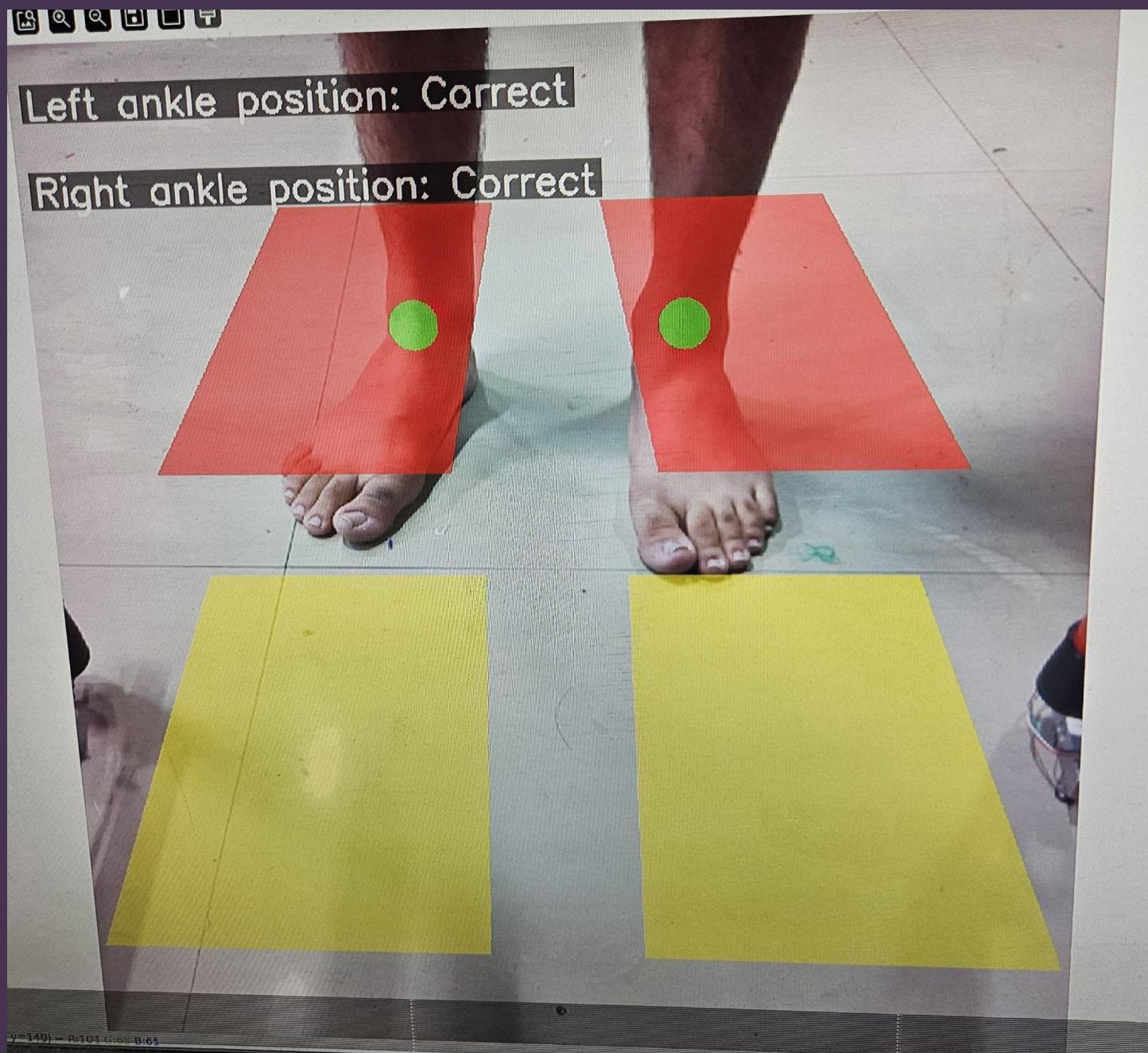


Walking Pattern

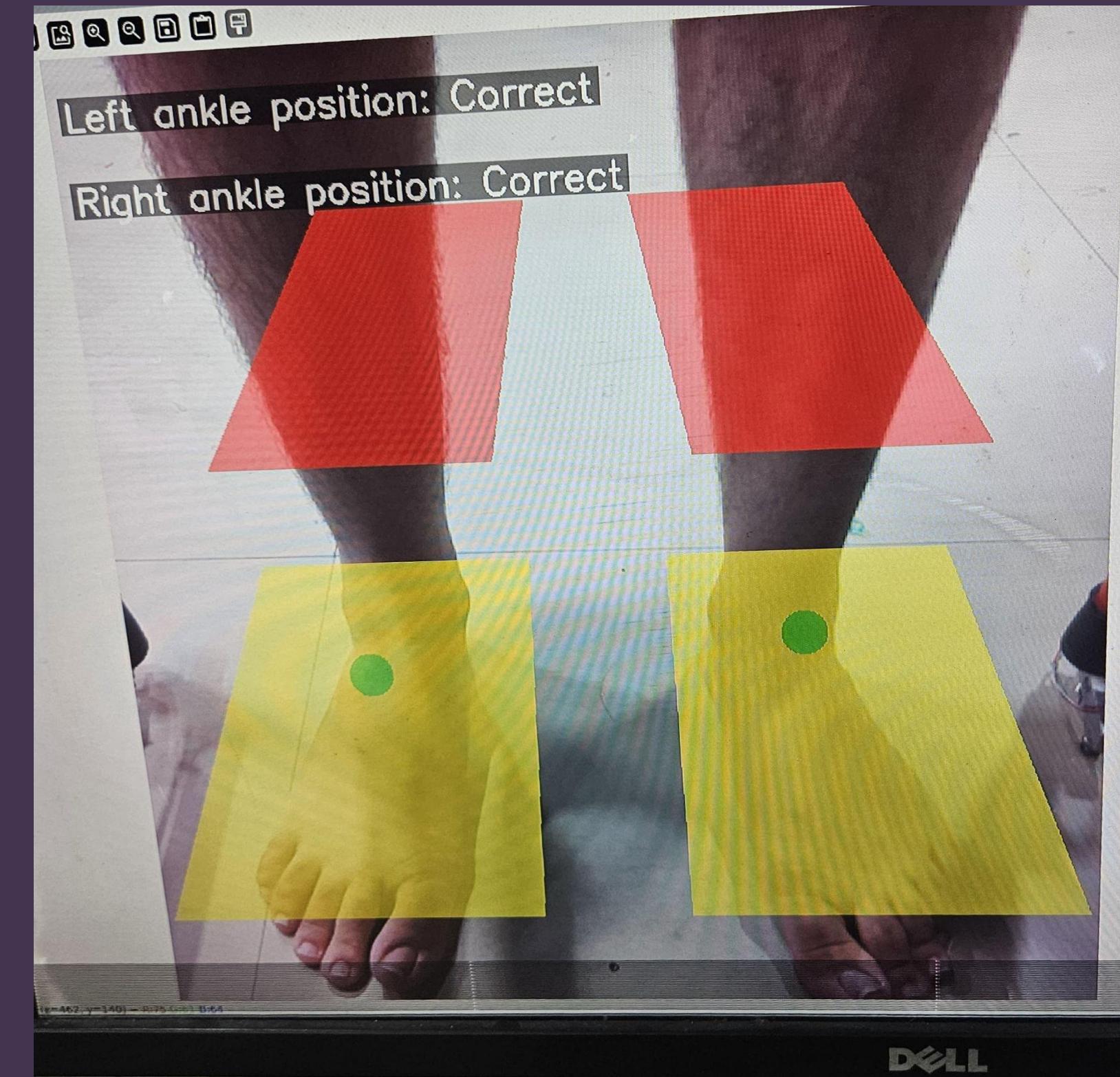


Feet Placement Feedback

- Working Video



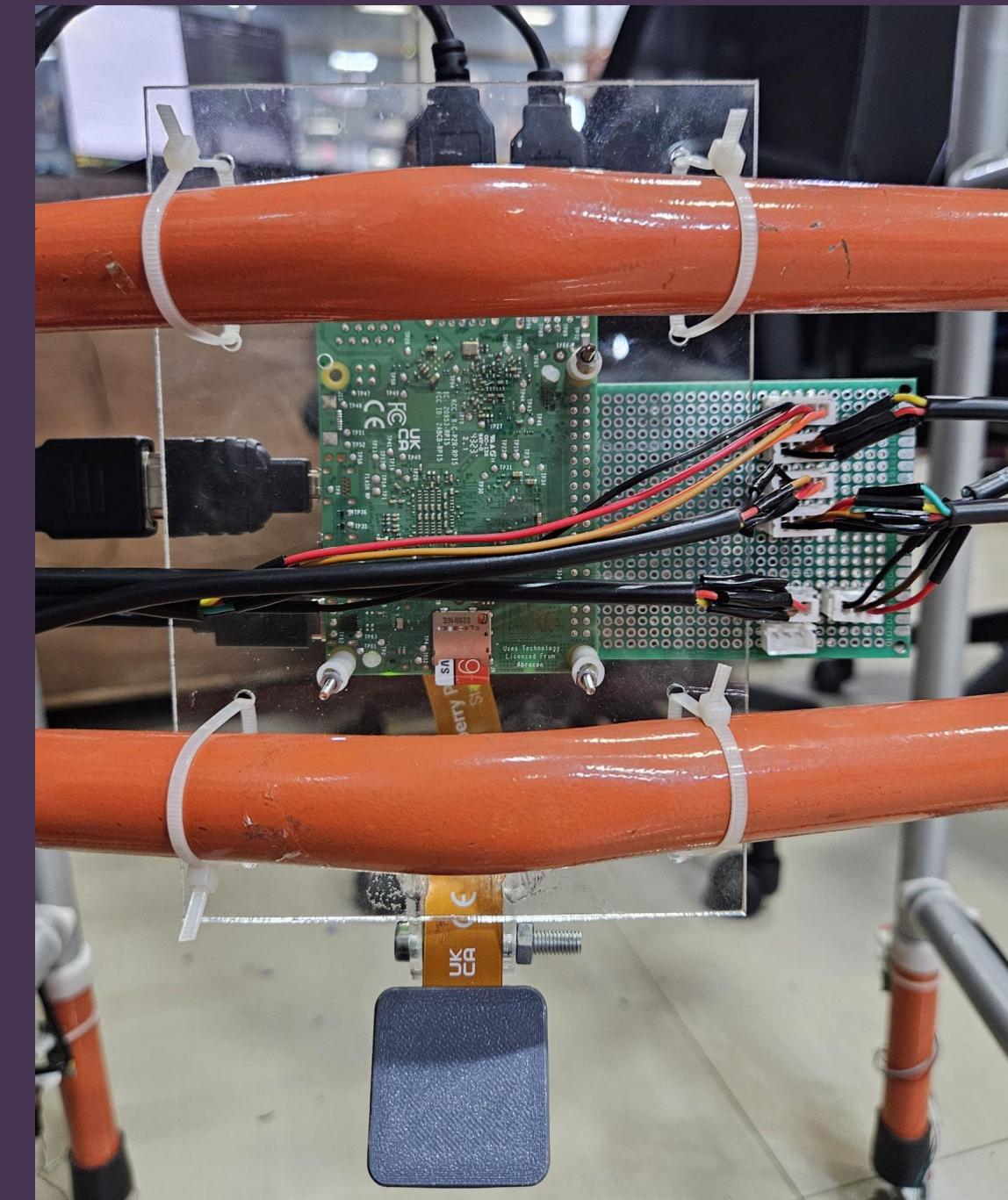
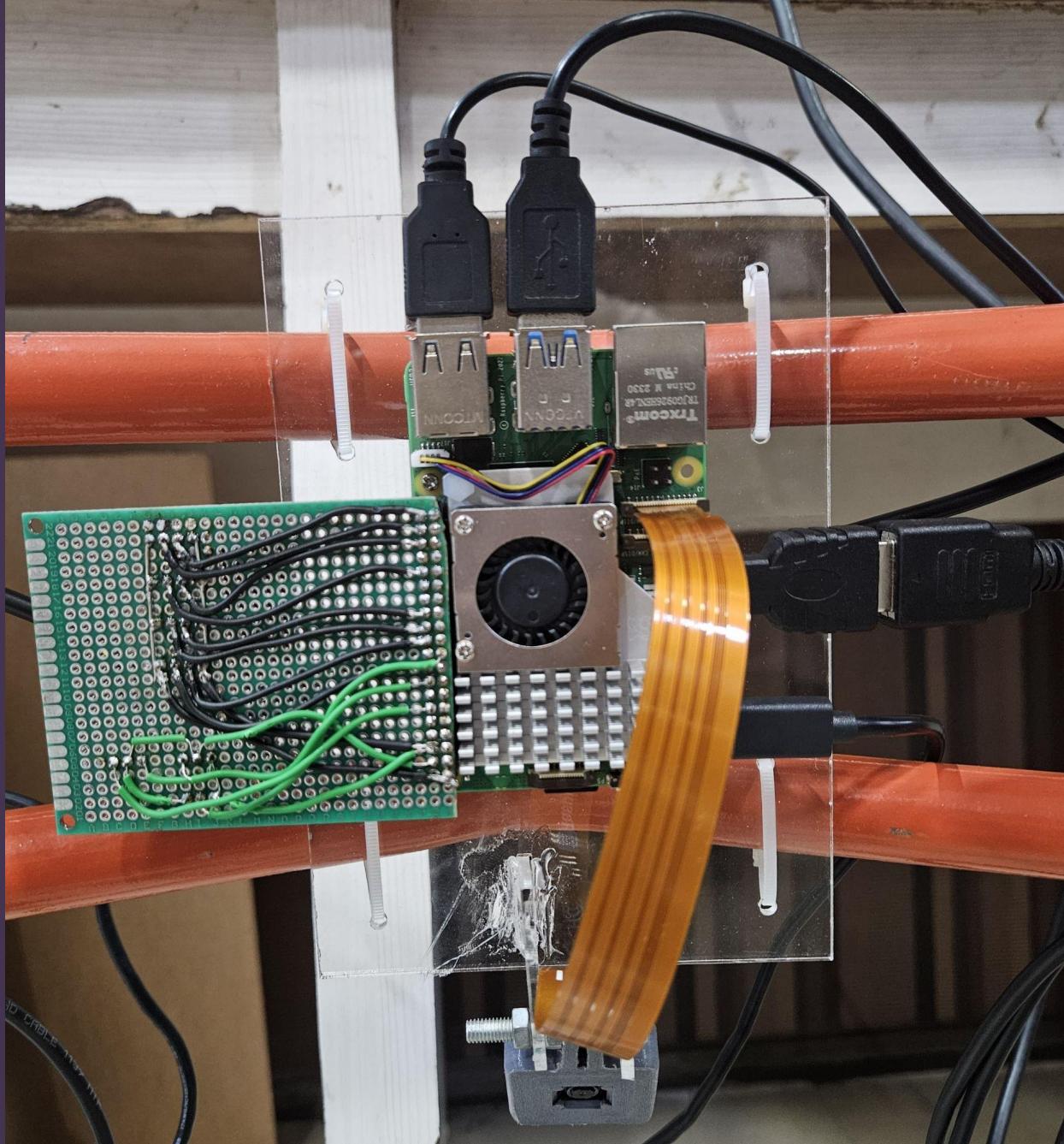
Feet Placement Feedback



Walker-Mounted Testing Assembly

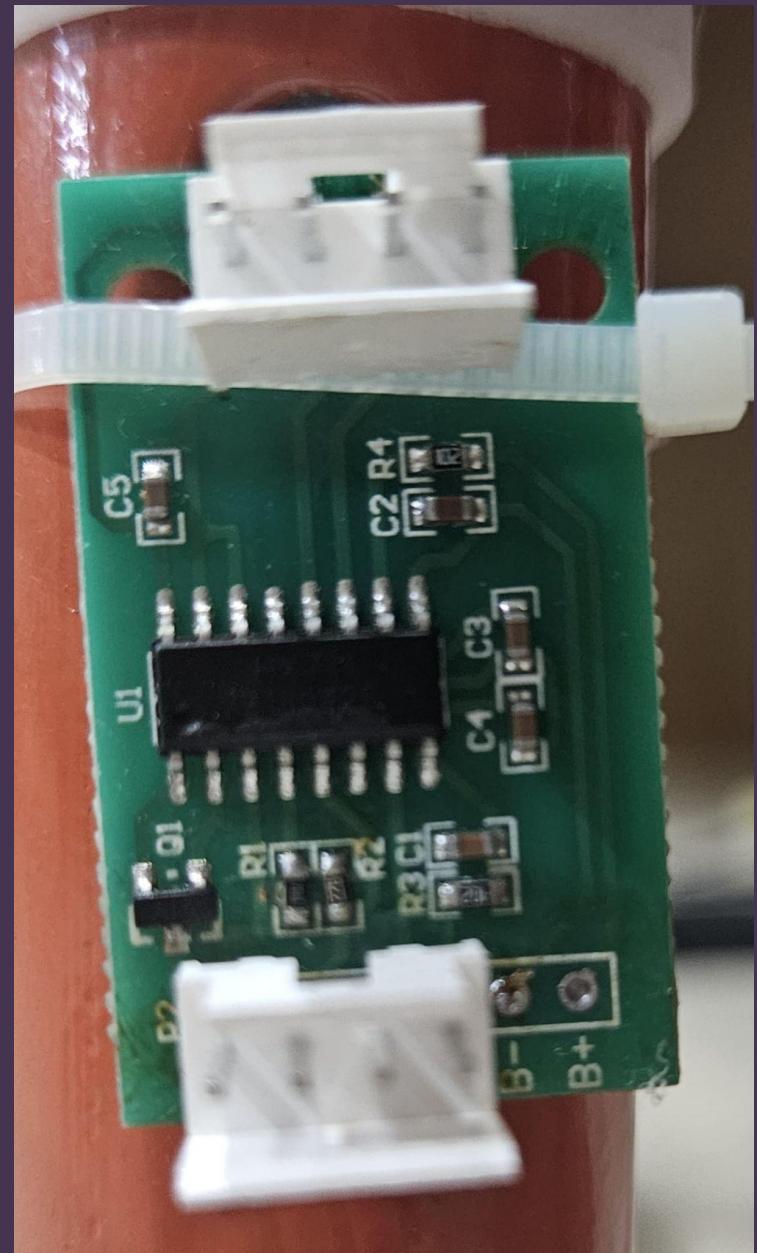
- Used an acrylic sheet to mount the microcontroller, camera module, and other components.
- Used zip ties for attaching it to walker for POC testing.
- Connected all components to the microcontroller using a perforated board, which will later be replaced by a PCB shield.

Walker-Mounted Testing Assembly



ADC - PCB

- **Current Setup:** Using a modified HX711 on a breakout board circuit.
- **Testing & PCB Design:** Evaluated the HX710A on a breadboard with load cells and designed a custom PCB for integration.
- **PCB Layout:** Designed the HX710A PCB layout based on specifications from the datasheet.

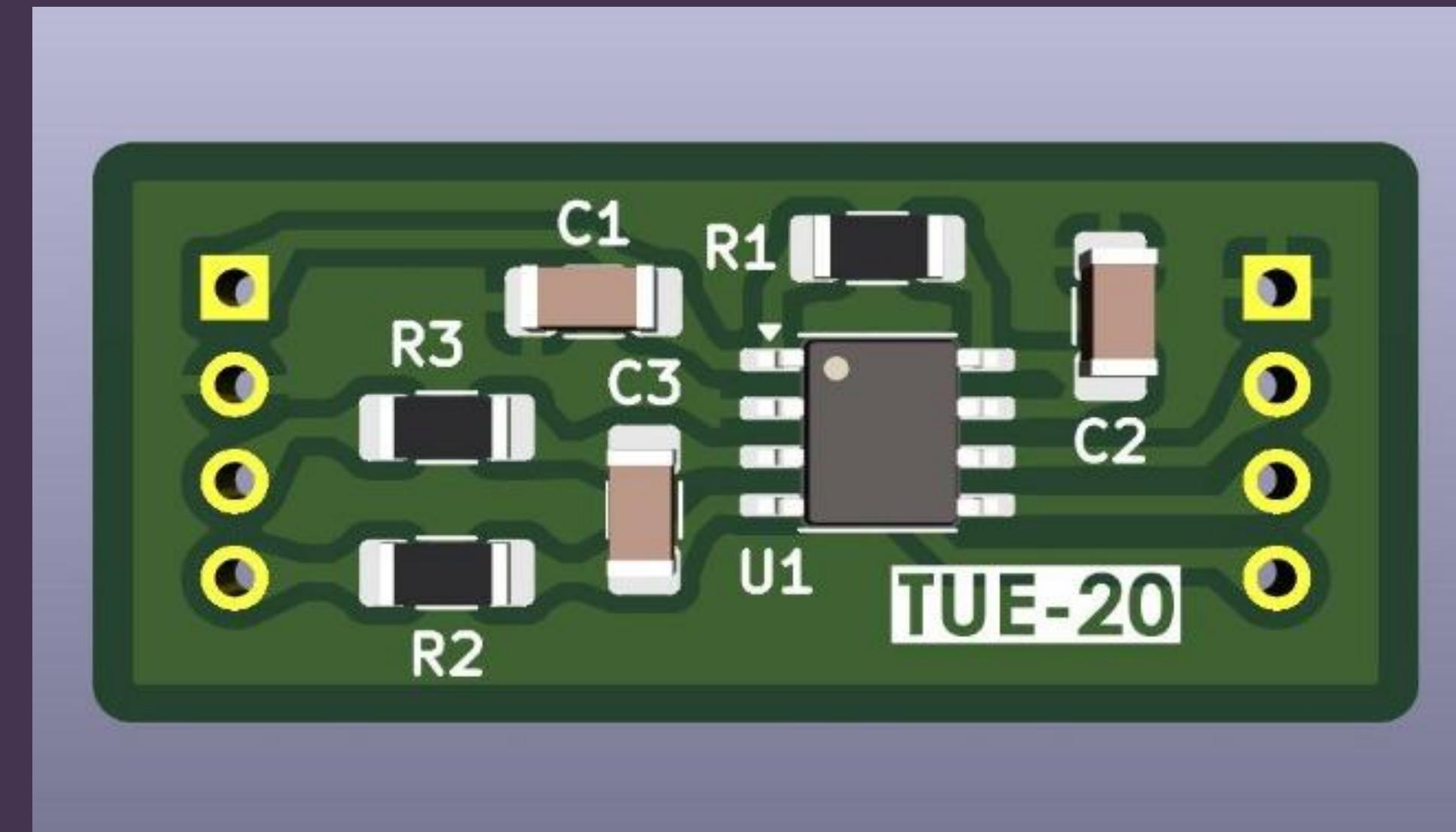
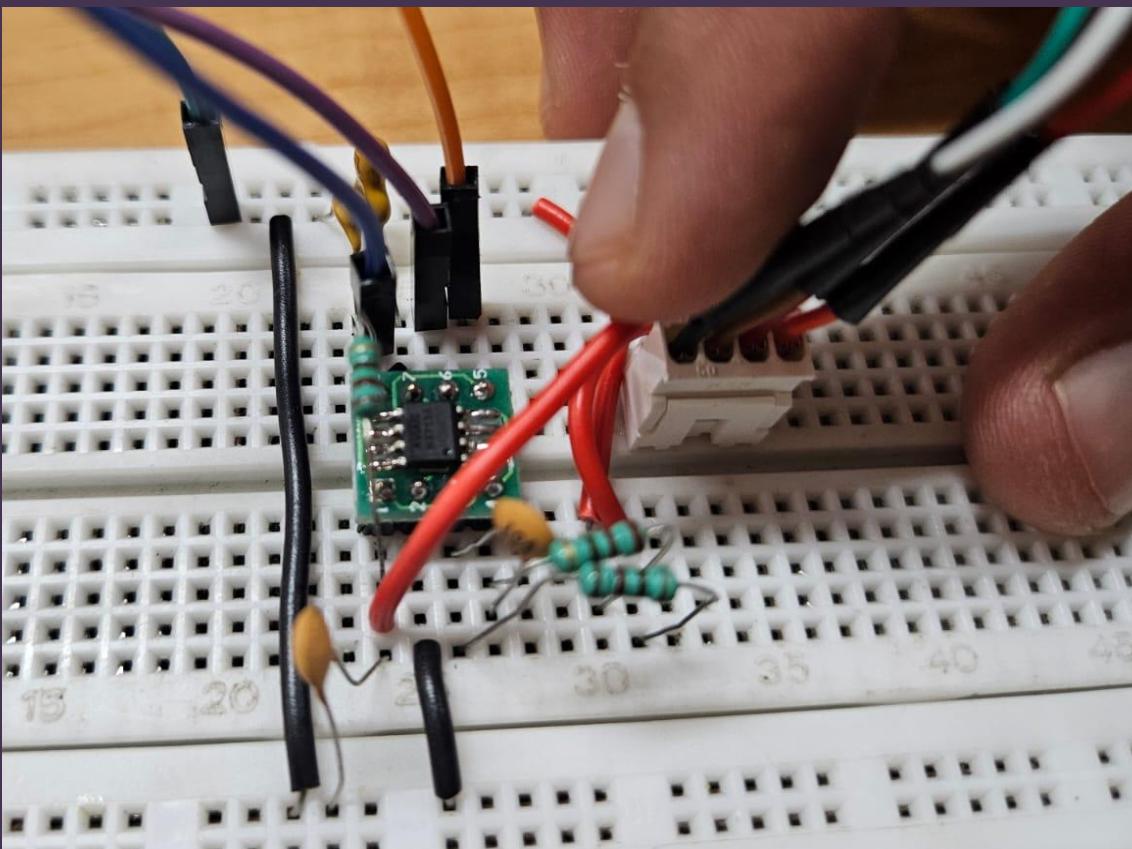


ADC Selection:

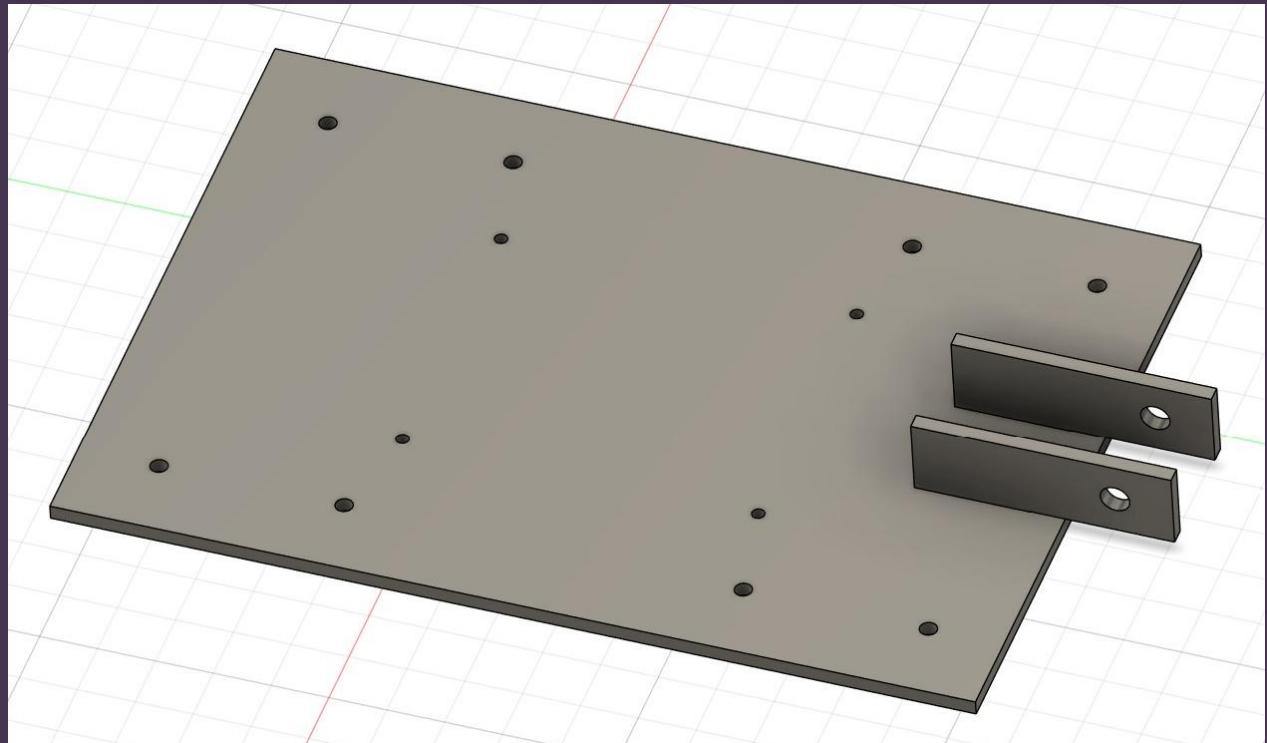
- The HX711 and HX710a ADC modules were evaluated for load cell data acquisition.
- **Sampling Rate Considerations:**
 - HX711: 10 SPS / 80 SPS
 - HX710A: 10 SPS / 40 SPS
 - Real-time applications need a minimum of 24 SPS, leaving us with two viable options: 40 SPS and 80 SPS. At higher sampling rates, noise and offset are lower for HX710A.
- **Final Selection:** While both will be used for prototyping, the HX710A has an integrated temperature sensor, aiding in calibration, making it the preferred choice for the final design. Also HX711 has extra channel which we are not using.

ADC - PCB

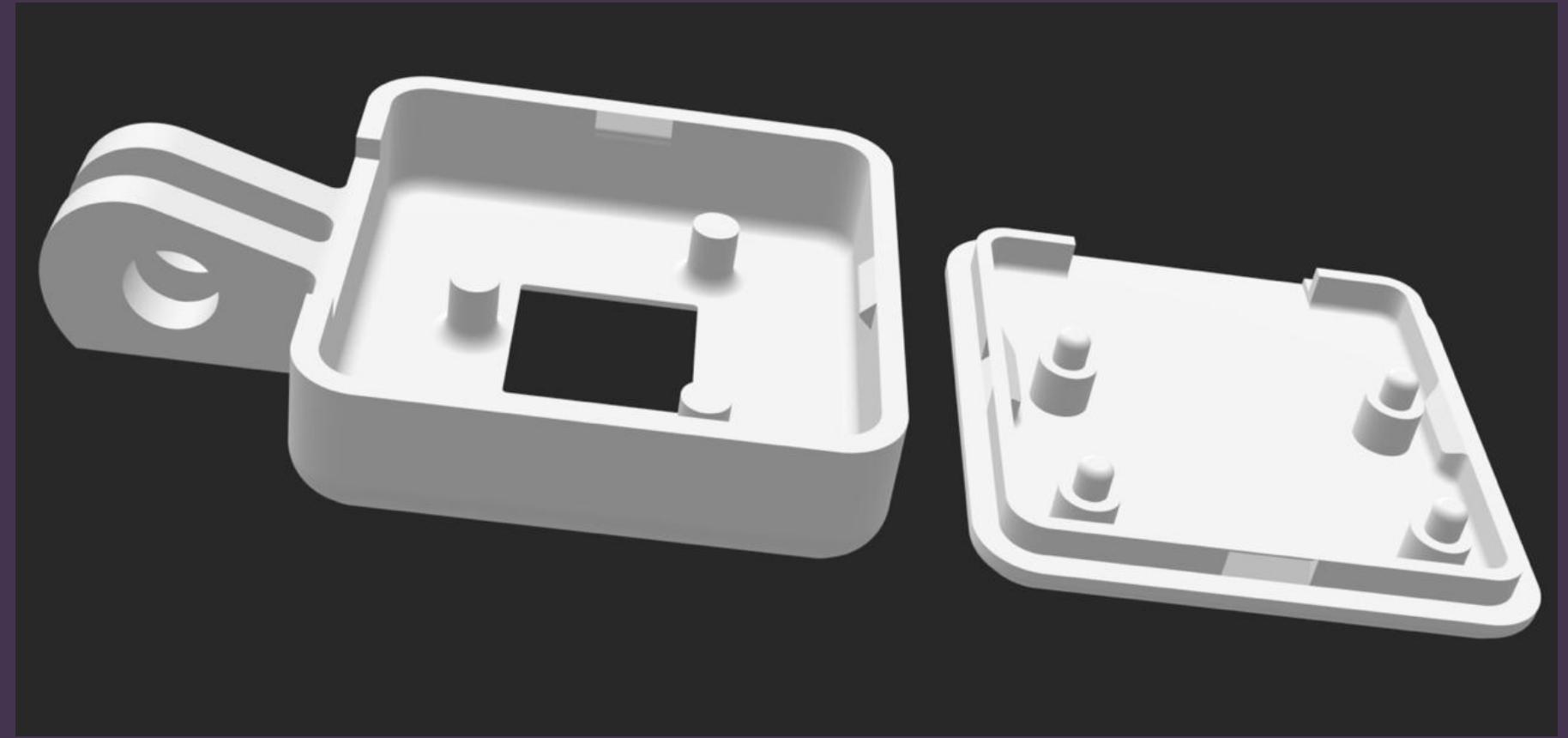
- [HX710a working video](#)



CAD model



Mount(for testing)

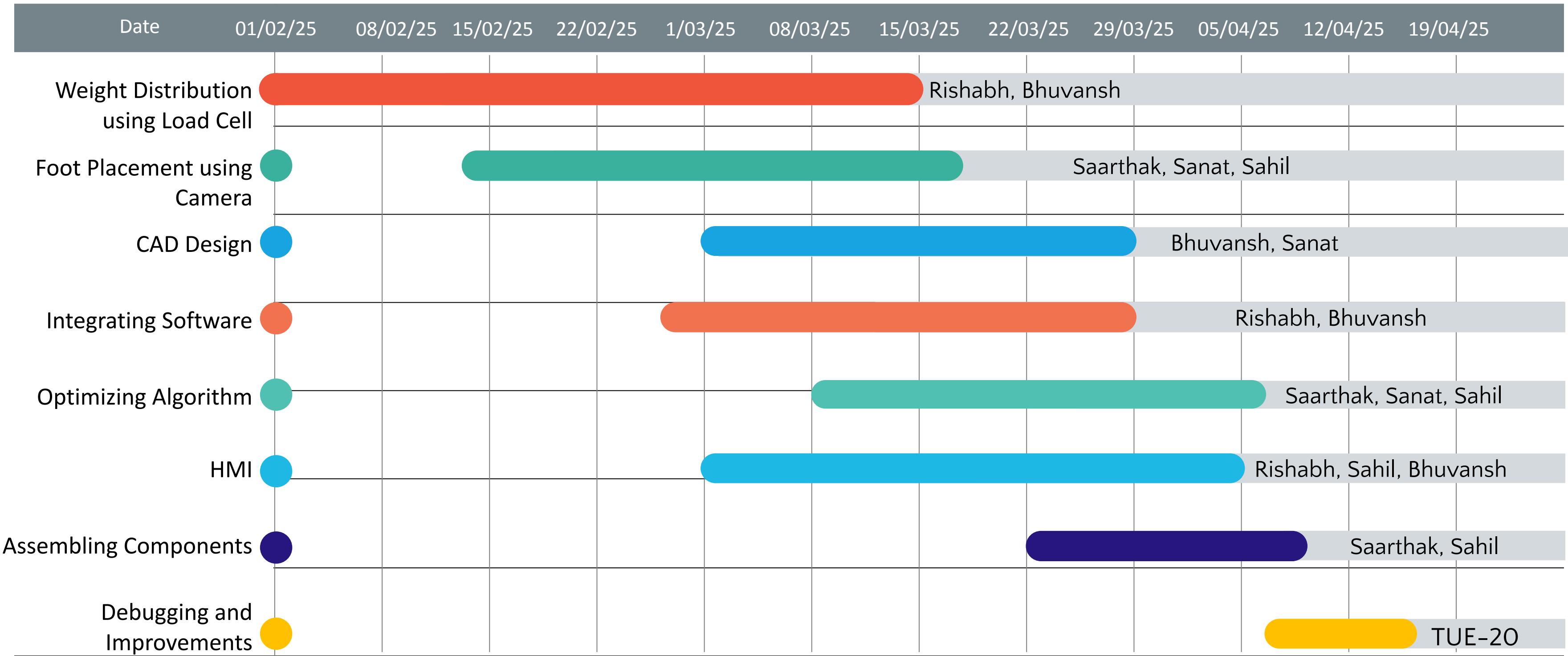


Camera Case



Progress and Deviations

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Deviations:

- **Foot Placement detection using camera :** Experimented with the stereo module and Raspberry Pi Camera 2.0, testing various YOLO pose detection models. Integrated a perspective view adjustment based on the camera angle relative to the foot.
- **CAD Design delay:** The CAD for the camera module is complete, but the enclosure design is delayed since it depends on preliminary testing to finalize the shield dimensions.
- **HMI :** The software for operating the walker is delayed due to extended component testing.



Plan for final Demo

Pending Tasks till final demo :

- **System Integration:** Developing code to synchronize the load cells, vibration module, and camera module for seamless operation.
- **HMI Software:** Implementing software for user interaction with the walker, including start functionality and post-use reporting.
- **Model Enhancement:** Improving foot placement accuracy by incorporating more advanced models or depth imaging or ARUCO markers.
- **Final Enclosure:** Designing a protective enclosure to securely house all assembled components.
- **Data Logging:** To send the recorded data to Doctors for further investigation.