

## MOTIVATION

The ankle is the most commonly injured body part in sports

80% of ankle injuries are inversion sprains

of inversion sprains are recurring

Existing ankle braces are stiff and static  
and limit the ankle's range of motion

## SPECS

< 40ms response time

400°/s inversion detection

12h battery life

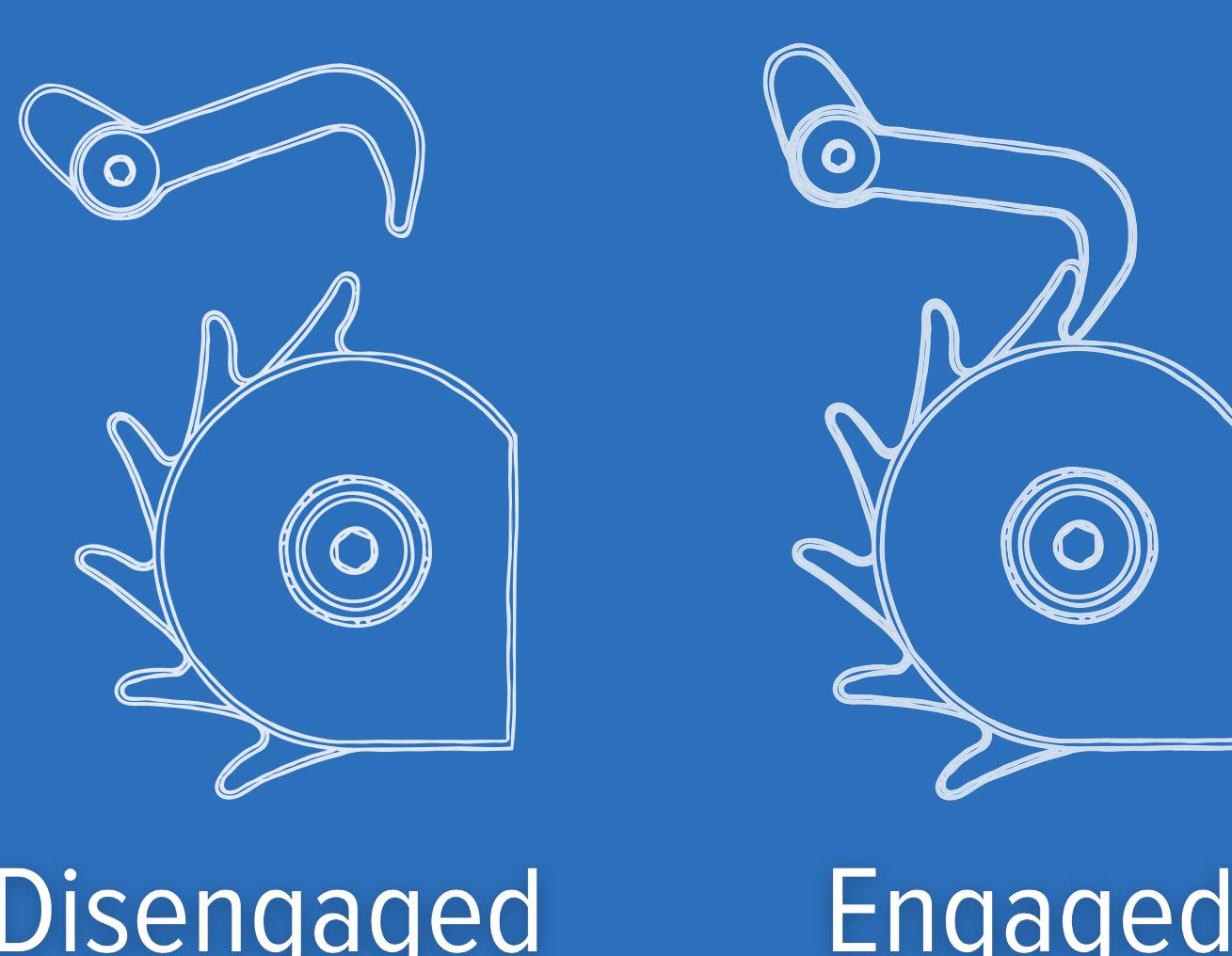
500g weight

## CONCEPT

Our solution is a dynamic ankle brace design  
that offers the best of both worlds:

- ❖ Full range of motion during active use
- ❖ Dynamically stiffens to prevent injury
- ❖ Customizable trigger threshold

## Binary Latching Mechanism

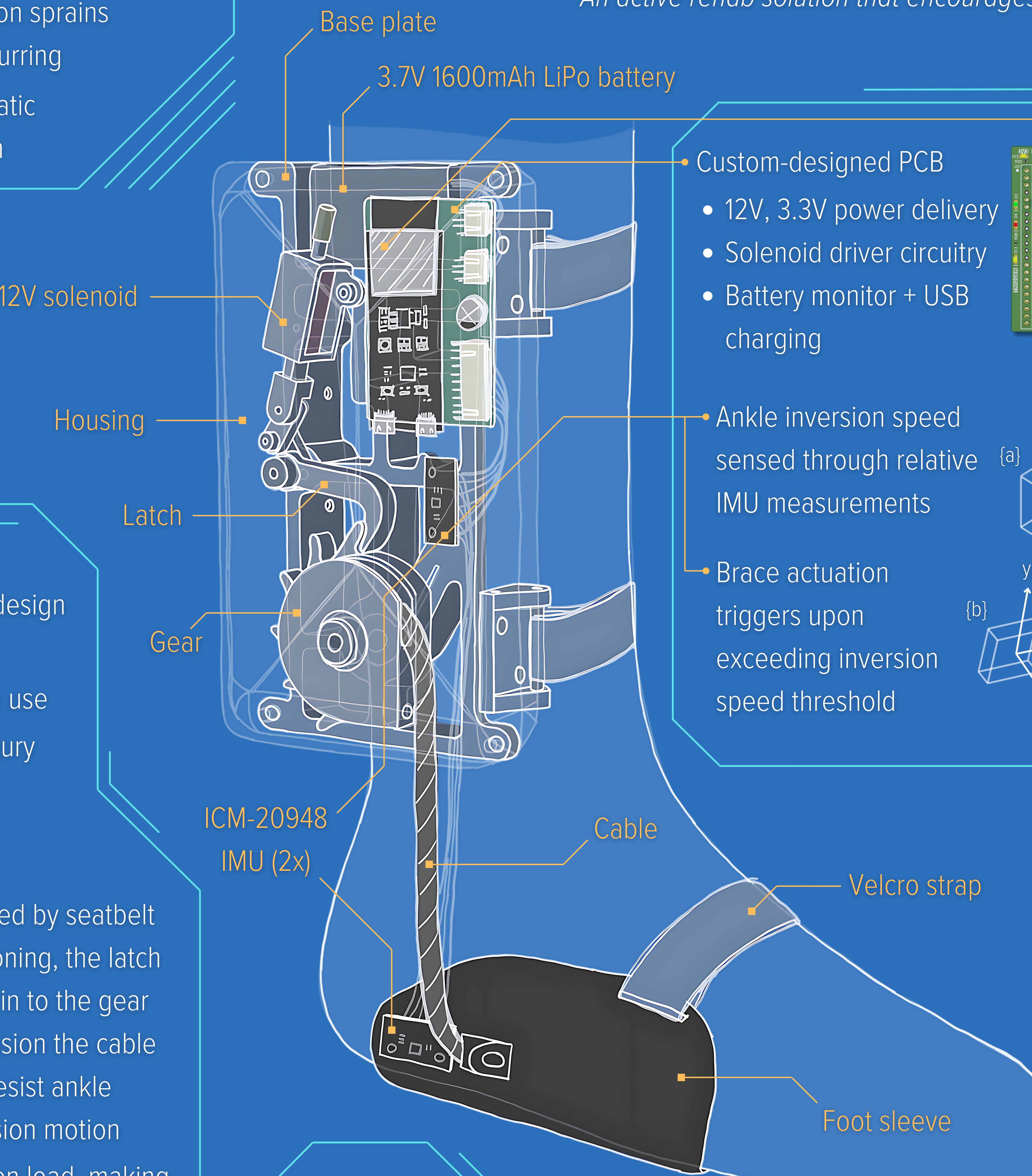


Inspired by seatbelt tensioning, the latch locks in to the gear to tension the cable and resist ankle inversion motion

The actuator does not bear the inversion load, making this design optimal over alternatives such as using direct motor torque control to tension the cable

# DYNAMIC ANKLE SUPPORT

An active rehab solution that encourages freedom of mobility while preventing injury



## TEAM 41



Aidan Gratton



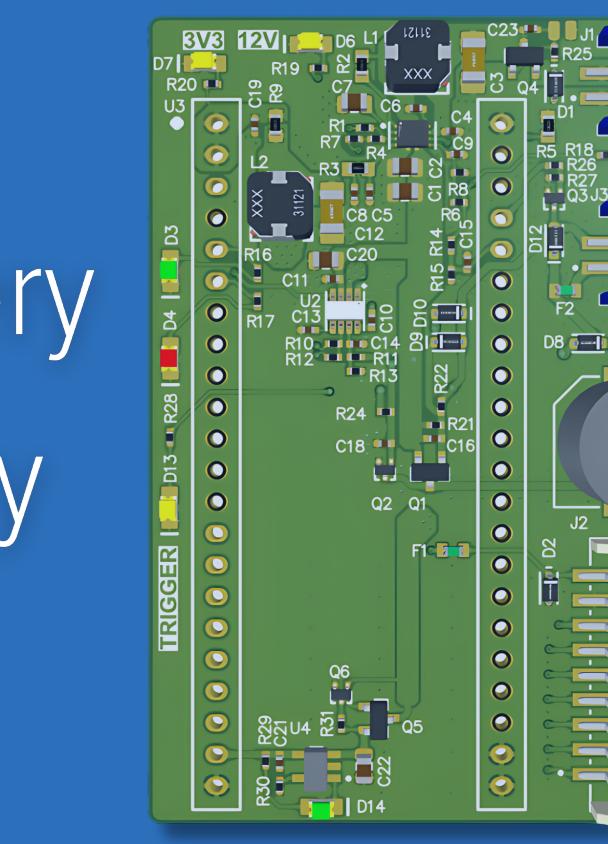
Asha Mills Emmett



Kyle Hong



Cindy Li

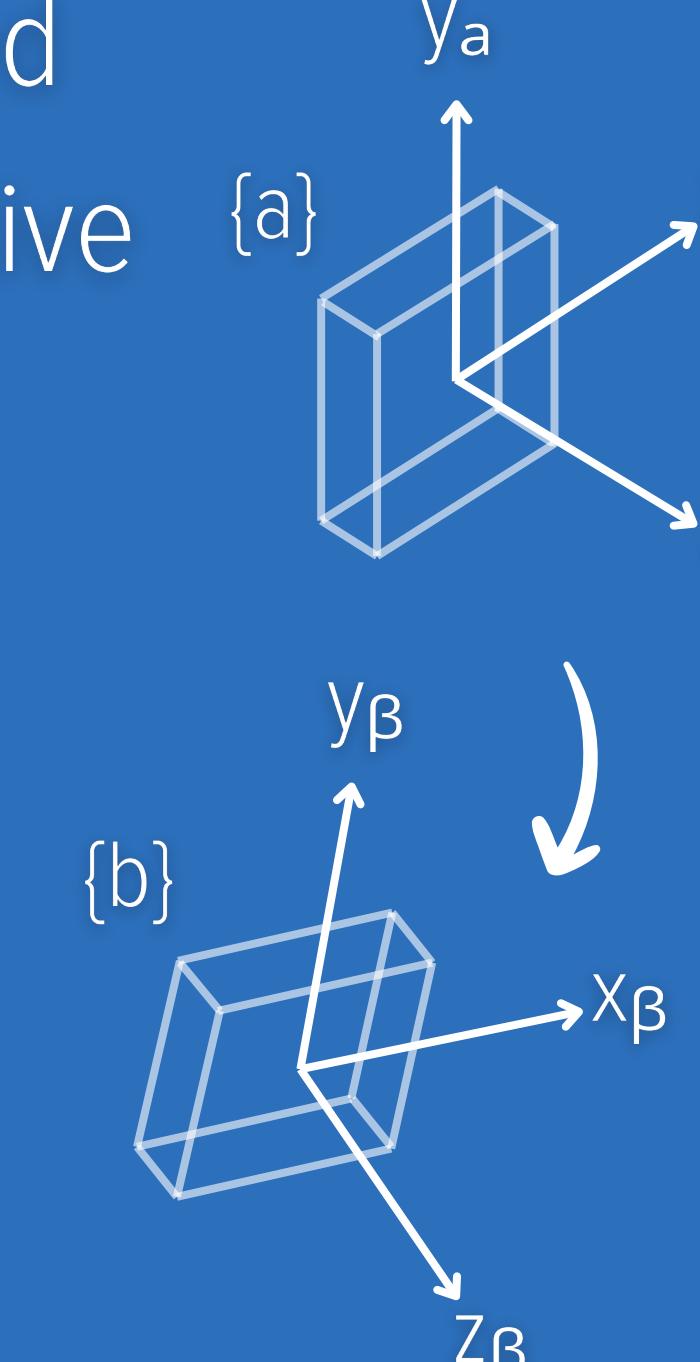


## Custom-designed PCB

- 12V, 3.3V power delivery
- Solenoid driver circuitry
- Battery monitor + USB charging

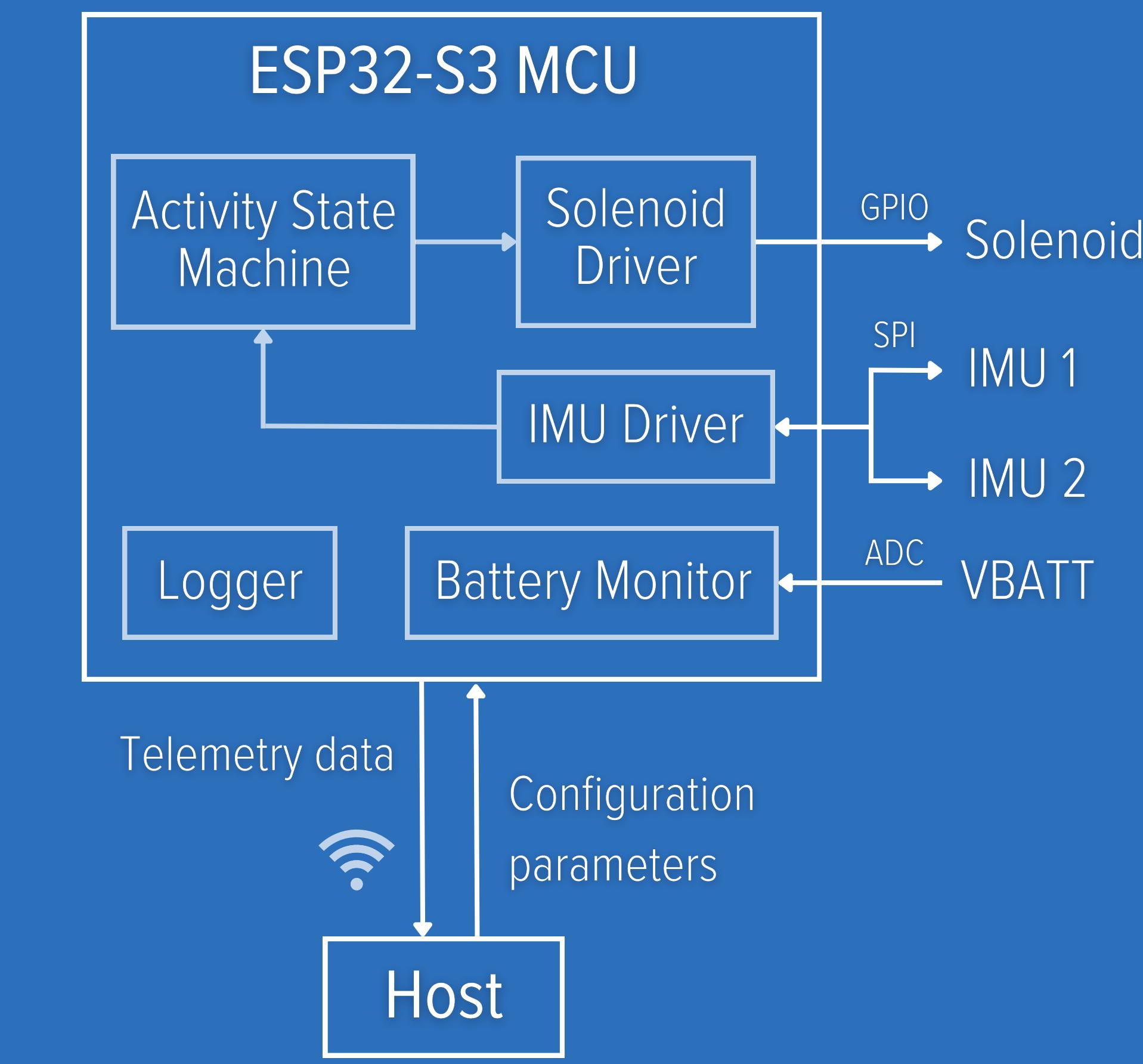
Ankle inversion speed sensed through relative IMU measurements

Brace actuation triggers upon exceeding inversion speed threshold



## TECH

ESP32-S3 compute + connectivity

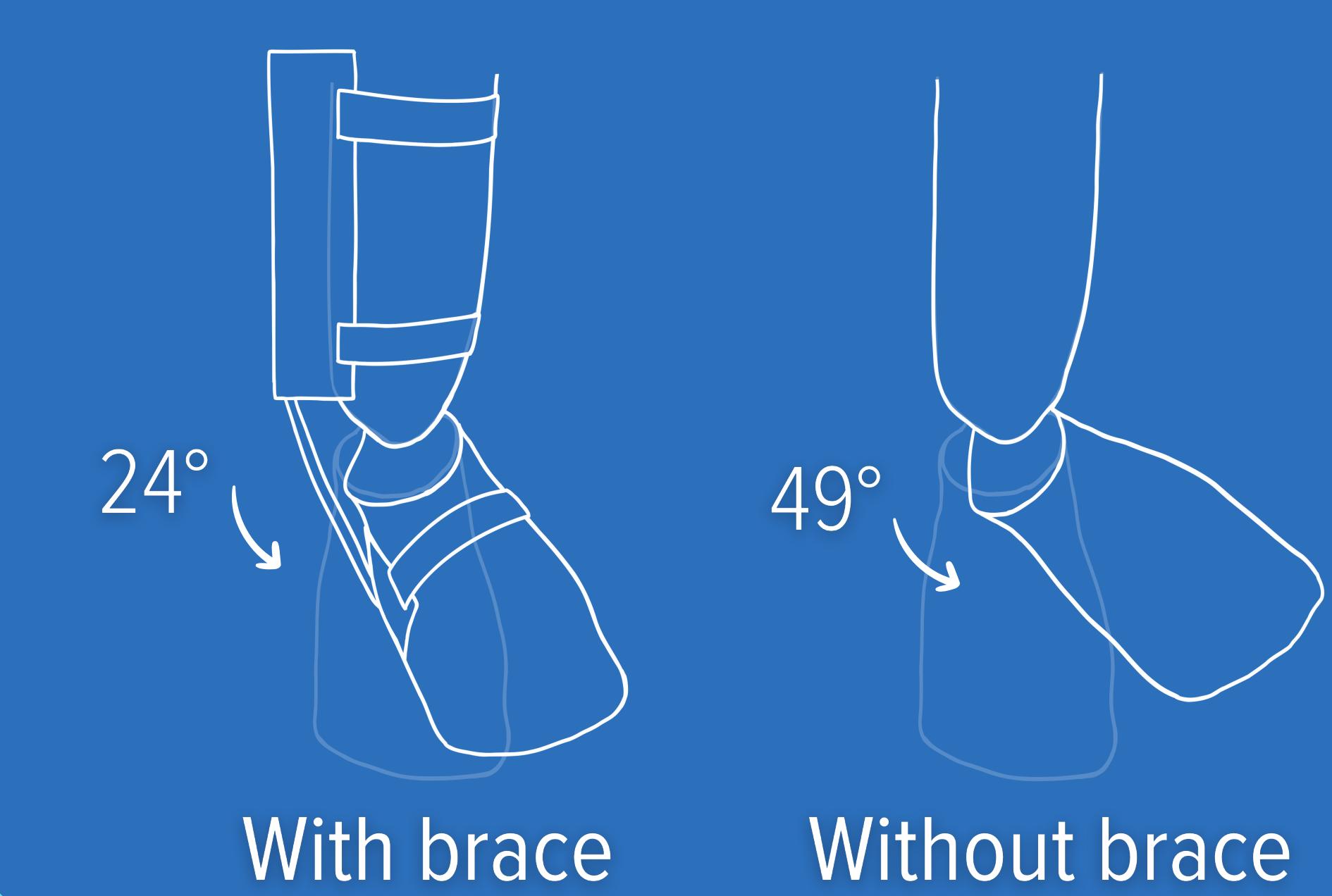


## EVALUATION

Response time test: under 40ms

Actuation test: fully stiffens when detected inversion speed is >400°/s

AB test:



With brace

Without brace

## SUPPORT

Stephen L. Smith, PhD, PEng  
Robert Burns, MS, CAT(C), CSCS

Michael Mayer, PhD, PEng  
Sanjeev Bedi, PhD, PEng