Collaborative Research: NRI: INT: Customizable Lower-Limb Wearable Robot using Soft-Wearable Sensor to Assist Occupational Workers

Myunghee Kim (Lead PI, UIC), Heejin Jeong (Co-PI, UIC), W. Hong Yeo (PI, Georgia Tech)

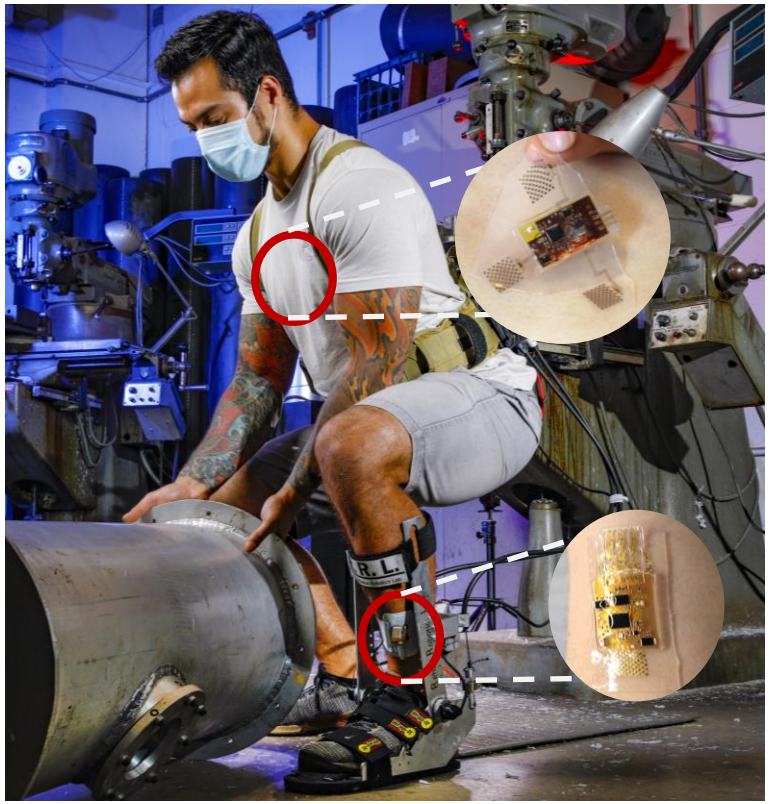
Goal: Personalization in lower-limb assistive wearable robots to reduce physical effort in physically intensive activities, thereby reducing injury.

Challenges:

1) Slow physical effort estimation
2) Uncomfortable biofeedback sensors
3) Difficult to evaluate personalization methods for physically intensive activities.

Solutions:

1) Customize assistance using time-efficient estimation of the user's physical effort
2) Employ soft wearable electronics
3) Iteratively integrate and evaluate the assistance methods



Scientific Impacts

- Fast and efficient ways of physical effort estimation, applicable for various activities
- Customized assistance in a wearable robot specifically for physically intensive activity
- Wireless and soft wearable electronic system
- Ergonomic and systematic assessment

Broader Impacts

- Efficient physical effort estimation can be used to personalize rehabilitation
- Soft wearable sensors can be applied in robotics and medical application, related to diagnosis, monitoring, and therapeutics
- The projects integrate research and education

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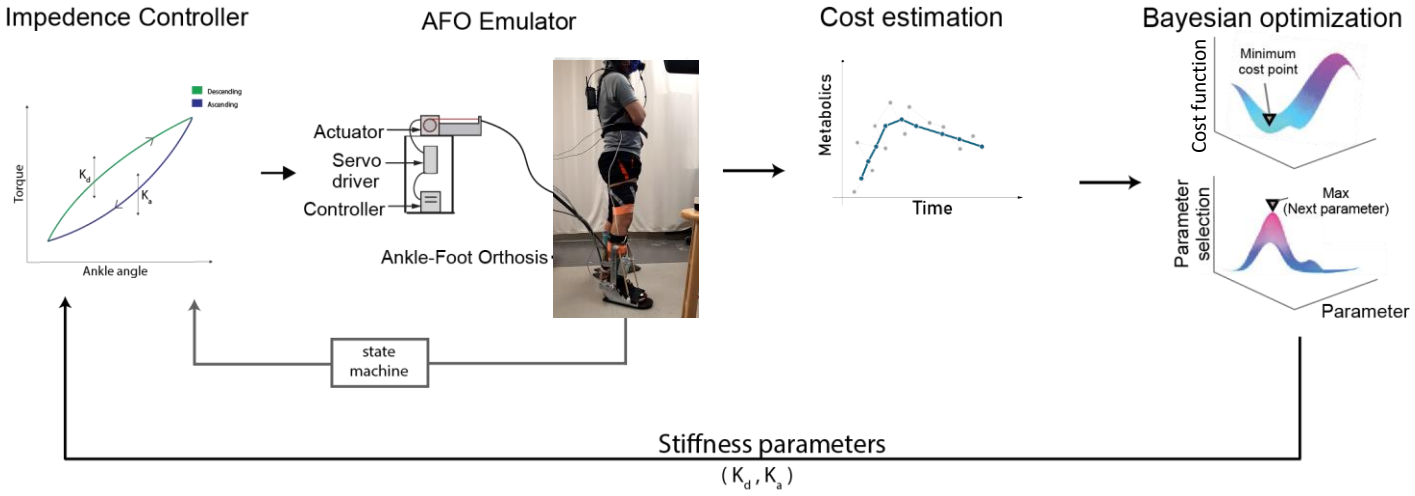
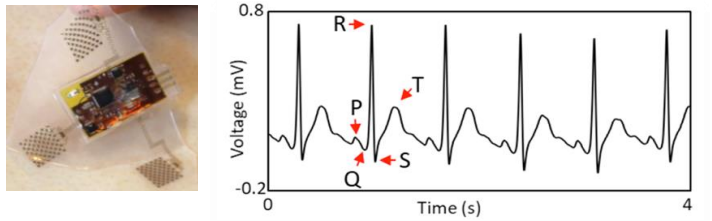
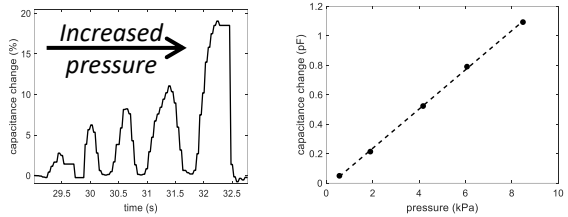


ECG by a biopatch



Pressure measured by a biopatch



Aim1: Fast HIL optimization
time-efficient estimation of the user's physical effort, to be used as the cost function to be minimized when optimizing assistance

Aim2: Soft wearable electronics
for monitoring multiple physiological signals including ECG, heart rates, EMG, blood oxygen saturation, and pressure sensing.

Aim3: Integration & Evaluation
of the personalized assistance provided by the robotic ankle exoskeleton

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