

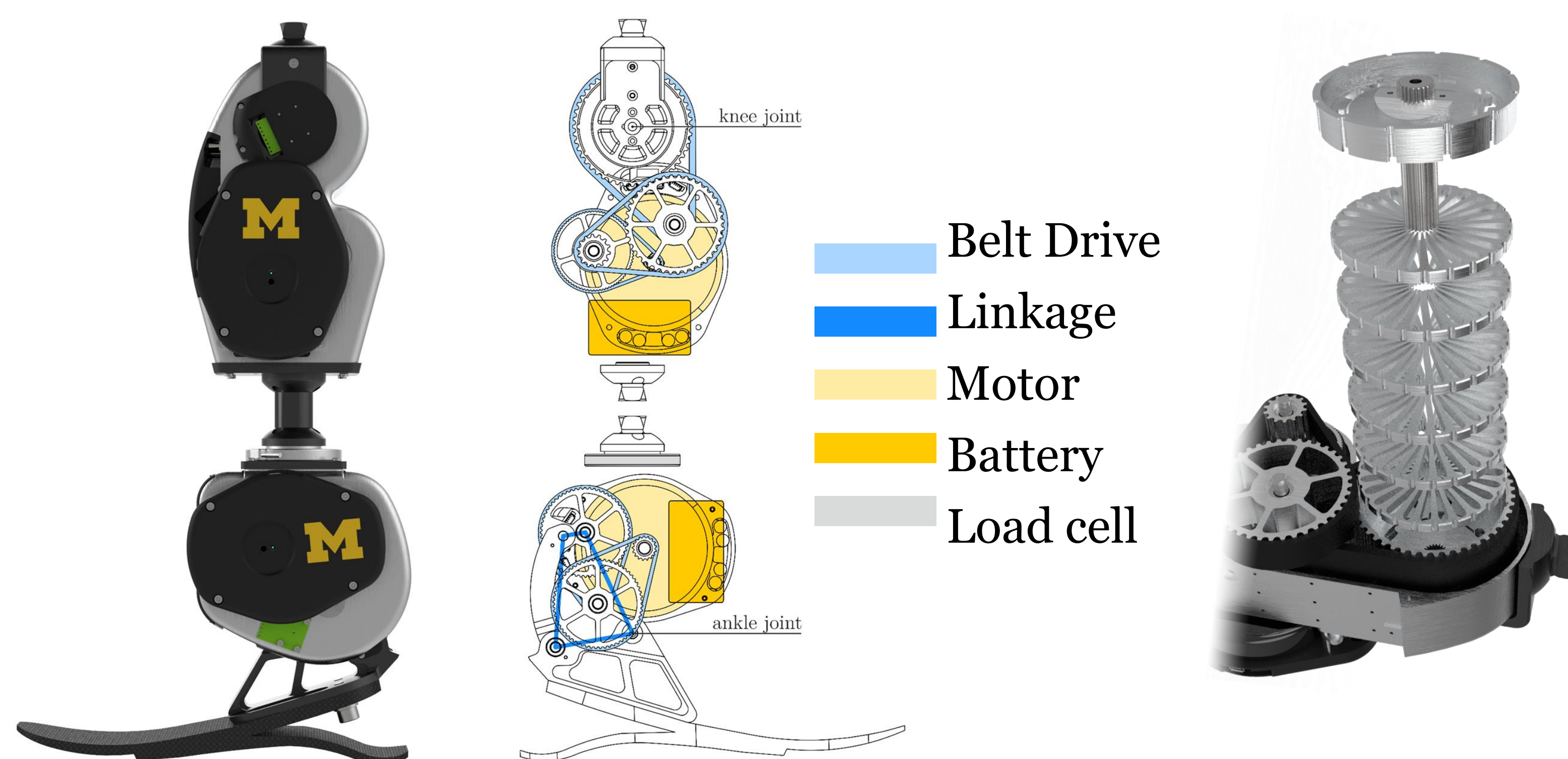


# Collaborative Research: NRI: INT: An Open-Source Framework for Continuous Torque Control of Intuitive Robotic Prosthetic Legs

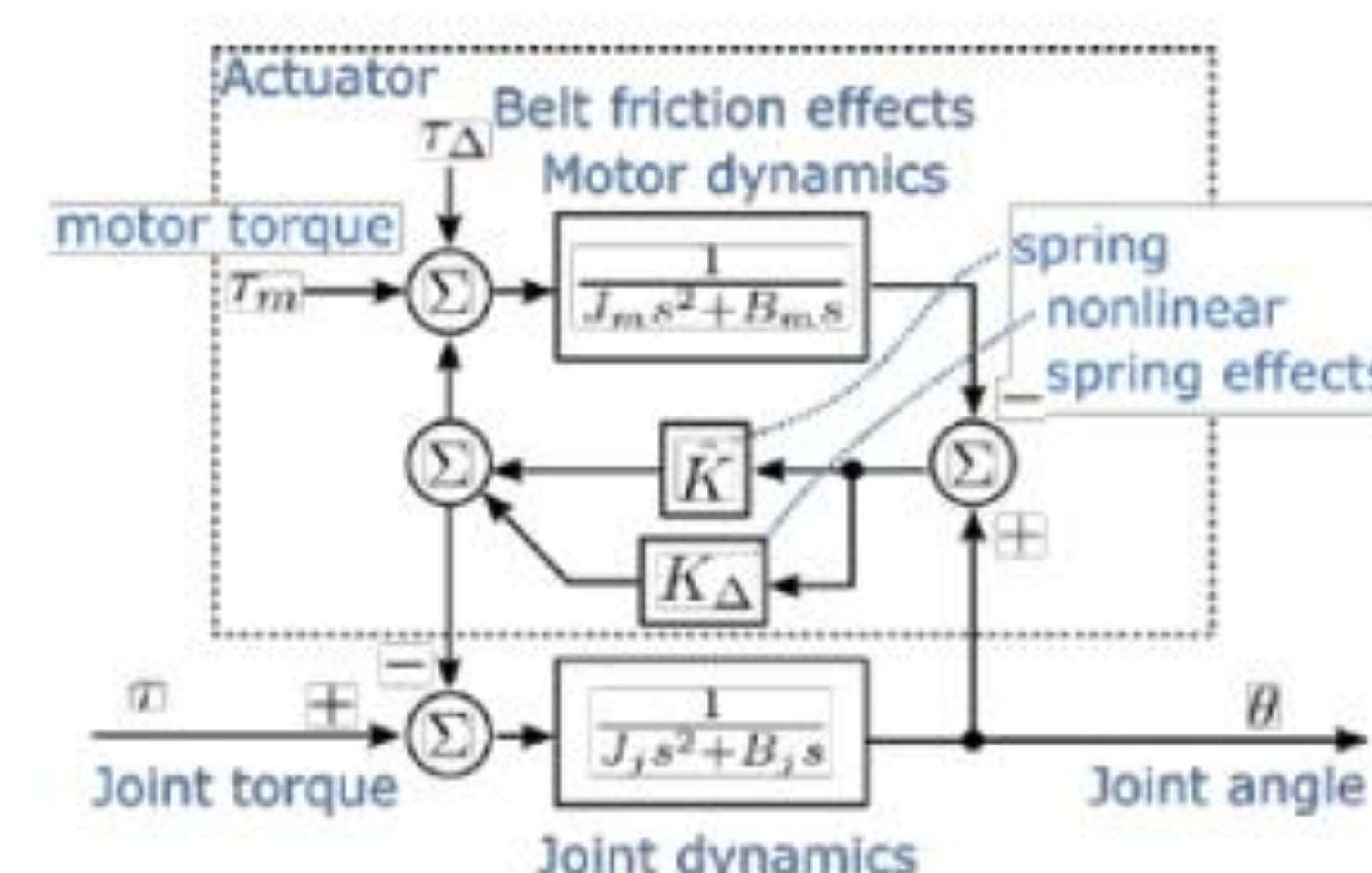
Eric Rombokas (UW/Lead PI), Robert Gregg (UM PI), Elliott J Rouse (UM CO-PI)

Robotic prostheses have compact, powerful motors that can potentially improve the mobility, agility, and stability of above-knee amputees. Current controllers struggle to provide transient, continuous, and unstructured movement. Taking advantage of dynamic force control, instead of kinematic or position control, also remains a challenge.

The powerful open-source leg (OSL) is a state-of-the-art robotic prosthetic leg that provides an affordable and standardized hardware platform.

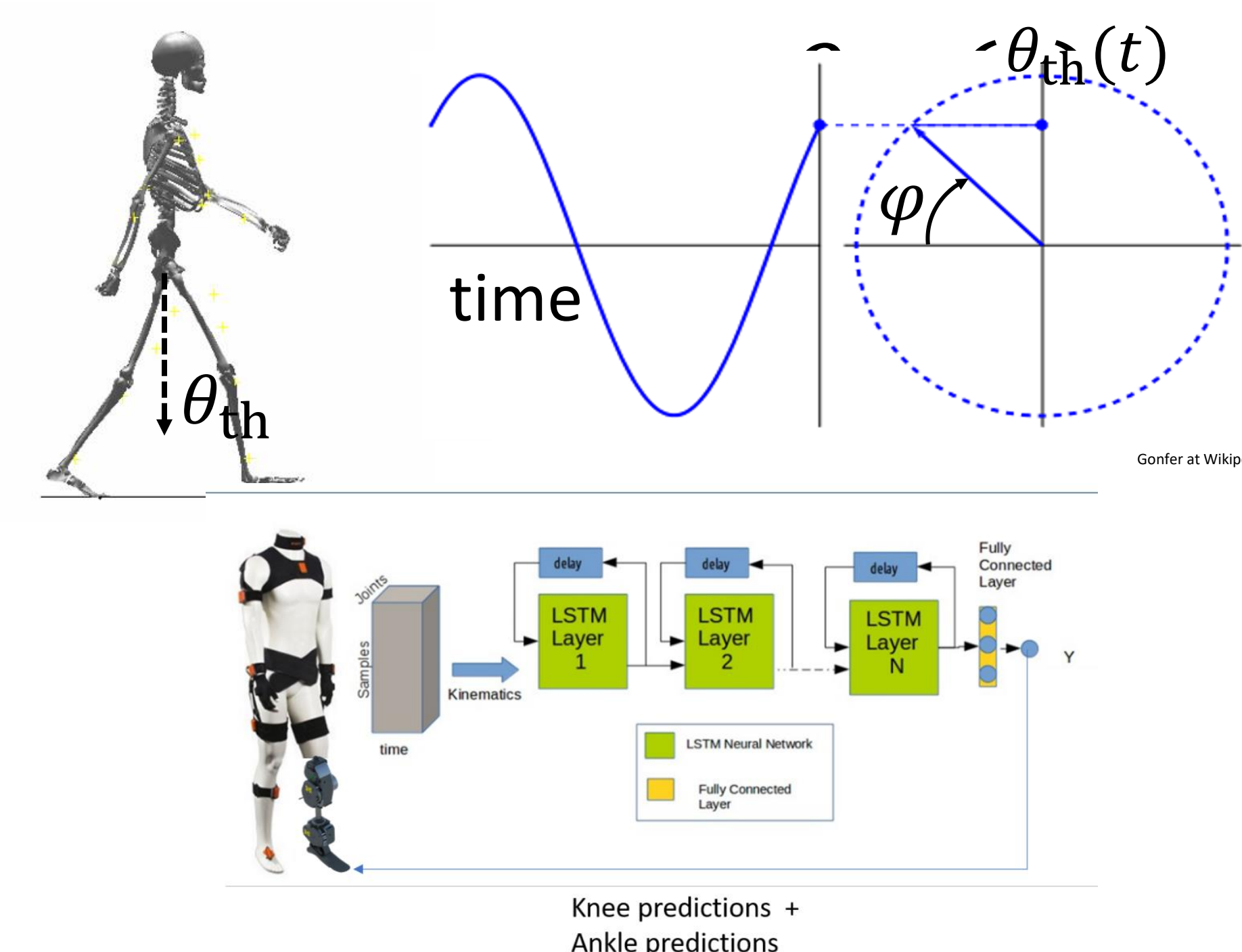


**IMPACT:** Many robotic approaches to prosthetic limbs and orthotic assistive technologies fail to achieve much impact, because they fail to bridge the gap from concept or prototype to application. We use a Human Centered Design framework, simultaneously improving hardware and control, while incorporating scientific, engineering, and clinical stakeholders throughout the research. This technology could be a game changer for people with mobility impairment resulting from limb loss.



## Torque and Impedance

We will extend the OSL hardware project to include torque and impedance control, using series elastic actuation and a full state feedback controller. We will also extend disturbance observer theory to compensate for belt dynamics and spring behavior.



## Continuous Control

We will extend our two continuously synchronized controllers that provide kinematic reference trajectories based on body movement. We will integrate them with the new torque and impedance capabilities to provide dynamic impedance and torque control.