UCLA Samueli School of Engineering

Mechanical & Aerospace Engineering
Spring 2023 Seminar Series

Friday, April 7th, 2023, 12 PM – 1 PM
Klug Seminar Room, Boelter Hall Penthouse

Learning to take advantage of assistance: Principles of sensorimotor learning with applications to assistive devices

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ABSTRACT: When developing assistive devices to improve mobility, designers often consider reducing the energy cost of walking or reducing fall risk as key design objectives. However, the long-term adoption of these devices relies not only on achieving these objectives but also on the user's ability to accept assistance and ultimately decide to use that assistance instead of their default or habitual choices. Here, I will begin by describing our recent work in which we examine how people learn to acquire and accept assistance when adapting to walking on a split-belt treadmill. When the belts of this device are driven to move at different speeds, this creates an opportunity where the treadmill can perform net positive or negative mechanical work on the user, depending on the user's gait pattern. As a result, the user has to learn the appropriate features of their gait to modify to reduce the positive work performed by the limbs. Although people make rapid changes to their gait when initially experiencing a difference in belt speeds, the time course over which they learn to take advantage of the treadmill is much longer than what is traditionally allotted in studies of adaptive learning. Understanding the timescales over which people learn to use assistive devices is critical for designing effective algorithms that can provide assistance while adapting to changes in the user's behavior. I will conclude with a discussion of the possible neuropsychological processes that guide effort-based decision-making and their implications for the evaluation and long-term adoption of assistive mobility devices.

BIO: Dr. James Finley is an Associate Professor in the Division of Biokinesiology and Physical Therapy, the Department of Biomedical Engineering, and the Neuroscience Graduate Program at the University of Southern California. Dr. Finley and his research team in the Locomotor Control Lab at USC use experimental studies and computational models to understand how mobility is controlled in healthy individuals and individuals with neuromotor impairments such as stroke and Parkinson's disease. This work relies on principles of engineering, neuroscience, game design, biomechanics, and exercise physiology to ultimately design more effective interventions to improve mobility. Dr. Finley is also one of the founding directors of the USC SensoriMotor Assessment and Rehabilitation Training Center (SMART-VR Center). The Center's mission is to be an interdisciplinary center of excellence harnessing innovative advances in virtual reality to improve motor and cognitive function across multiple clinical populations such as stroke, Alzheimer's, and Parkinson's disease.

Pizza will be served

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