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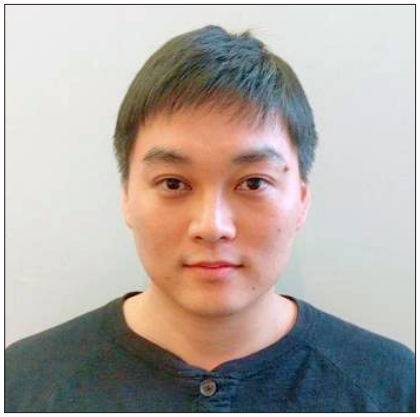

Seungmoon Song

Postdoctoral Fellow
Stanford University

Toward predictive simulation of human movement – for assistive devices and rehabilitation treatment

Thursday, January 28th
12:30 PM – 1:30 PM

Zoom Link:
https://northeastern.zoom.us/j/92709674829

Abstract: I will present my research towards predictive simulations of human movement for assistive devices and rehabilitation treatment. First, I will talk about a neuromechanical control model based on simple reflexes. The model can generate diverse locomotion behaviors, react to perturbations similarly to humans, and explain why walking performance declines with age. However, as the model was focused on low-level motor control primarily for steady locomotion behaviors, extending and verifying the model for more complex movements and reactions is necessary for producing reliable predictions for novel scenarios. In the later part, I will present recent projects on conducting a human experiment with gait assistive exoskeletons and using deep reinforcement learning to developing complex control models. In the experimental study, we found using human-in-the-loop optimization that it is possible to substantially increase self-selected walking speed with ankle exoskeletons. Regarding deep reinforcement learning, we organized the Learn to Move competition, where participants developed controllers for a human musculoskeletal simulation model. The competition has been organized at the NeurIPS conference since 2017 and has attracted over 1300 teams from around the world. At last, I will discuss my plan of incorporating rigorous experimental validations and advanced computational techniques toward neuromechanical models that could change the way we design rehabilitation treatment and study human movement.

Speaker bio: Seungmoon Song is a postdoctoral researcher in the Mechanical Engineering Department of Stanford University. He is also a recipient of an NIH K99 award and the lead organizer of the NeurIPS: Learn to Move competition. His research focuses on modeling the neuromechanics of human movement and applying it to rehabilitation and robotics. As a postdoc, he is working on improving human walking performance with exoskeleton assistance using human-in-the-loop optimization. During his Ph.D. at the Robotics Institute of Carnegie Mellon University, he proposed a reflex-based control model that could explain various aspects of human locomotion including diverse locomotion behaviors of healthy adults, responses to unexpected disturbances, and performance degradation in aging.