

From biomechanics to bionics: how scientific insights can unleash our imagination, inspire new tech & broaden the use of wearable robots in society

Abstract

Wearable assistive devices – exoskeletons, prostheses and smart clothing – have exciting potential to alleviate and prevent physical disabilities, helping to keep our society active and workforce healthy. But these benefits are only realized if devices are properly designed and integrated with the human user, and with their daily lifestyle. This human-device integration challenge has proven deceptively difficult, in large part because of the remarkable complexity of human movement. Sometimes our most thoughtfully-brainstormed, carefully-engineered designs are nonetheless not ideal, practical or effective. And sometimes the “obvious” design solution is not the best solution; or not the best for a subset of the population. The focus of this seminar will be on how scientific insights from the field of human movement biomechanics can lead to exciting, unexpected and often non-intuitive new design solutions for assistive technologies. Innovative new design solutions have the potential to accelerate and broaden the use of wearable robots throughout society, specifically amongst underserved industries and segments of the population.

Bio

Dr. Zelik co-directs the Center for Rehabilitation Engineering & Assistive Technology (CREATE) at Vanderbilt University. CREATE aims to improve health, mobility and independence for individuals with disabilities, and to enhance human capabilities beyond biological limits, by engineering, measuring, optimizing and understanding technologies that physically augment human performance. Dr. Zelik’s research team employs experimental and computational methods to study human biomechanics (the science of movement) and how biomechanical principles can translate into improvements in assistive devices (prostheses, exoskeletons, smart clothing). Dr. Zelik received his B.S. and M.S. in Biomedical Engineering from Washington University in St. Louis, then his Ph.D. in Mechanical Engineering from the University of Michigan. Following this, Dr. Zelik was a post-doctoral researcher and Whitaker International Scholar at the Santa Lucia Foundation Rehabilitation Hospital in Rome, Italy. He joined the Mechanical Engineering faculty at Vanderbilt University in 2014, and holds secondary appointments in the departments of Biomedical Engineering and Physical Medicine & Rehabilitation.