MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Thursday, March 5 2026 at 14:00-14:30, Lady Davis Building, Auditorium 250

Learning to Walk Together: User–Exoskeleton Adaptation Across Repeated Gait Training Sessions

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Participant using the ReWalk exoskeleton with crutches during motion analysis measurements.

Powered lower-limb exoskeletons are a compelling mechatronic solution for assisted walking, but real-world use depends on more than hardware performance: users must learn how to coordinate their body, the device, and crutches to produce stable, repeatable gait. The image illustrates this human–robot system in practice — an exoskeleton user walking with crutches — highlighting the control and coordination challenge behind "assisted walking."

In this seminar, I will present a motion-analysis study of 17 healthy participants with no prior exoskeleton experience who trained with the ReWalk Personal 6.0 across repeated sessions. Using a multi-camera motion-capture setup, we recorded full-body kinematics of both the user and the device and quantified learning along three engineering-relevant dimensions:

1. Movement consistency – do segment trajectories become more repeatable from gait cycle to gait cycle (reduced variability)?
2. Timing synchronization – does user–robot timing alignment improve across sessions?
3. Balance strategy – how does crutch placement evolve relative to the combined user–exoskeleton center of mass (CoM) as users gains skill and confidence?

To connect objective measurements to user experience, participants also completed short questionnaires at the first and final sessions (perceived synchronization, comfort, safety and ease of learning). The results reveal a clear learning curve, with the largest improvements occurring early in training and more gradual changes thereafter. Beyond exoskeletons, this work highlights how motion capture and interpretable metrics can be used to evaluate human–robot coordination and guide the development of adaptive, user-aware control strategies in wearable robotics.

Seminars Coordinator: Prof. Sefi Givli

Note: the seminar will be given in Hebrew