



## Mechanical Engineering Seminar

**Monday, November 10, 2025 at 14:30**, D. Dan and Betty Kahn Building, Room 217

Online: <https://technion.zoom.us/j/92448854417>

### **From Motion Modeling to Real-Time Feedback: Advancing Human-Robot Collaboration in Surgery**

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**Hosted by: Prof. Alon Wolf**

Robotic systems are increasingly used in high-stakes domains that demand precision and safety, with surgical robotics serving as a prominent example. In surgical robotics, technical proficiency is crucial to patient outcomes; however, surgeons' training still relies on human instructors, which makes it costly, time-consuming, and challenging to scale. My vision is to address this gap by developing intelligent robotic systems that can automatically deliver adaptive feedback comparable to that of a human trainer. In my doctoral research, I created quantitative methods for evaluating surgical performance, including novel orientation-based skill metrics and movement analysis approaches inspired by computational motor control. I designed and tested training protocols that applied force and motion perturbations to improve surgical skill robustness. I also led a longitudinal study with surgical residents, which produced a unique dataset on their long-term learning processes and the effects of fatigue on performance. In my postdoctoral work, I built on these foundations to enable the future development of intelligent feedback systems for robotics. To improve surgical robots' awareness of their operators, I integrated multi-modal sensing, including tool vibration measurements and eye tracking, into robotic platforms and launched projects using artificial intelligence to enable autonomous feedback. In this talk, I will present selected projects to demonstrate how modelling human movement, designing targeted interventions, and integrating advanced sensing with robotic control can advance skill development and human-robot collaboration. I will conclude with future directions toward robotic systems capable of adaptive, multi-modal feedback, with applications spanning surgical robotics and other domains where humans and robots work together to achieve demanding tasks.

Yarden Sharon received her B.Sc. (Cum Laude) and Ph.D. (direct track) in Biomedical Engineering from Ben-Gurion University of the Negev, working with Prof. Ilana Nisky. She completed her postdoctoral training in the Haptic Intelligence Department with Dr. Katherine J. Kuchenbecker at the Max Planck Institute for Intelligent Systems, Germany. Her research lies at the intersection of robotics, human motor control, and human-robot interaction, with a focus on surgical robotics and intelligent training systems.

