MECHANICAL ENGINEERING SEMINAR

Monday, December 9 2024 at 14:30, D. Dan and Betty Kahn Building , Room 217

Online: http://technion.zoom.us/BestSeminarEver

Learning in-hand perception and manipulation with adaptive robotic hands

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Hosted by: Assoc. Prof. Izhar Or, Dr. Nili Krausz, and the J.W. Ullman Center for Manufacturing Systems and Robotics

Effective robotic manipulation requires adaptability to varied objects and dynamic settings. Traditional rigid hands, while accurate, face limitations in cost, fragility, and control complexity. Underactuated, compliant hands offer a simpler, more adaptable alternative but introduce uncertainties in hand-object interactions. This research addresses these challenges by equipping adaptive hands with advanced perception and learning algorithms. We developed tactile sensing for robust pose estimation in occluded environments and introduced AllSight, a high-resolution, 3D-printed tactile sensor that bridges the sim-to-real gap with zero-shot learning. Further, we applied reinforcement learning and haptic glances to improve insertion accuracy under spatial uncertainties. Expanding on this, we explored visuotactile perception to handle the specific demands of contact-rich tasks like insertion.

Through tight perception-action coupling, our approach enables compliant hands to perform complex tasks with minimal human input and rapid adaptability. This work lays a foundation for versatile robotic systems capable of high-level tasks across healthcare, warehousing, and industrial automation, advancing accessible, high-capability robotic hands

Osher received his B.Sc. and M.Sc. degrees in mechanical engineering from Ben-Gurion University of the Negev in 2019 and 2020, respectively. He earned his Ph.D. from the School of Mechanical Engineering at Tel Aviv University, focusing on learning manipulation skills with adaptive robotic hands. Throughout his studies, Osher was recognized with several awards, including the Nehemia Levtzion Scholarship, the KLA scholarship, the Mechanical Engineering Graduate Research Award and the Fulbright Postdoctoral Fellowship to pursue research at the University of California, Berkeley.

Seminars Coordinator: Assoc. Prof. Shmuel Gal.