



MECHANICAL ENGINEERING PhD SEMINAR

Thursday, July 23 2026 at 13:30, Lady Davis Building, Auditorium 250

Energy Storage and Harvesting Solutions for Renewables and Soft Robotics

Sofia Kuperman

Adviser: Prof. Amir Gat

The need for efficient energy storage systems remains one of the key bottlenecks in the transition toward widespread use of renewable energy. Achieving substantial improvements in the performance of energy storage beyond incremental gains requires rethinking overlooked aspects of those systems and developing new approaches that overcome the fundamental limitations of existing technologies.

This seminar will explore how fluid mechanics and multiphase transport can be leveraged to design better flow batteries. I will show how redesigning flow batteries to redirect their internal flow field can significantly increase discharge rates, and how controlling electrolyte transport in multiphase batteries enables higher effective conductivity and increased power output. Beyond stationary energy storage, I will show how flow batteries can be integrated into autonomous soft robots, where the energy storage system serves as a multifunctional component that preserves compliance and adaptability while providing power. I will also introduce a novel robotic thermodynamic energy system that offers an alternative approach to energy storage and environmental energy harvesting through multistable structures with embedded energy storage.

In a broader sense, this seminar will focus on the physical principles that enable multifunctional energy systems and discuss their implications for the future design of integrated energy-mechanical systems and autonomous soft robots.

Note: the seminar will be given in English