THE WEIZMANN INSTITUTE OF SCIENCE
FACULTY OF MATHEMATICS AND COMPUTER SCIENCE
Faculty Seminar

Room 155 ,Ziskind Building
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Large-scale multi-robot systems: From algorithmic foundations to smart-mobility applications

Abstract:

Multi-robot systems are already playing a crucial role in various domains such as manufacturing and warehouse automation. In the future, these systems will be incorporated into our daily lives through drone-delivery services and smart-mobility systems that comprise thousands of autonomous vehicles, to give a few examples. The anticipated benefits of multi-robot systems are numerous, ranging from increased safety and efficiency, to broader societal facets such as sustainability. However, to reap those rewards we must develop algorithms that can adapt rapidly to unexpected changes on a massive scale. Importantly, these algorithms must capture (i) dynamical and collision-avoidance constraints of individual robots, (ii) interactions between multiple robots, and (iii), more broadly, the interaction of those systems with their environment. These considerations give rise to extremely complex and high-dimensional optimization problems that need to be solved in real-time. In this talk, I will present progress on the design of systematic control and decision-making mechanisms to allow the effective, and societally-equitable deployment of multi-robot systems. I will highlight results on fundamental capabilities for multi-robot systems (e.g., motion planning and task allocation), as well as applications in smart-mobility systems. I will also discuss challenges and opportunities for smart mobility in addressing societal issues, including traffic congestion and fairness.