

Speaker: Gili Bisker, Tel Aviv University, Israel

Title: **Quantifying nonequilibrium dynamics from time-irreversibility in observed semi-Markov processes**

Far-from-equilibrium processes constantly dissipate energy while converting a free-energy source to another form of energy. Living systems, for example, rely on an orchestra of molecular motors that consume chemical fuel to produce mechanical work. Drawing inspiration from biology, where the underlying nonequilibrium activity gives rise to a plethora of emergent collective phenomena, we strive to capture their mechanistic essence in order to mimic life-like behaviour in synthetic systems. Estimating the amount of the free energy budget lost to dissipation is crucial for a deeper understanding of the underlying nonequilibrium dynamics of driven systems, aiming for general design principles for biomimicking custom-made systems. I will present a recently developed theoretical toolkit for estimating the dissipation from partial information, based on detecting time-irreversibility from asymmetry in waiting time distributions in observed semi-Markov processes. Using the framework of stochastic thermodynamics, bounds on the total entropy production are derived. The results of this work will advance new analytical and numerical approaches for quantifying nonequilibrium dynamics in stochastic systems, when only partial information is available.