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Connections between POMDPs and partially observed n-player mean-field games

In this talk, we will study a discrete-time model of mean-field games with finitely many players and partial observability of the global state, and we will describe the deep connection between such n-player mean-field games and partially observed Markov decision problems (POMDPs). We focus primarily on settings with mean-field observability, where each player privately observes its own local state as well as the complete mean-field distribution. We prove that if one's counterparts use symmetric stationary memoryless policies, then a given agent faces a fully observed, time homogenous MDP. We leverage this to prove the existence of a memoryless, stationary perfect equilibrium in the n-player game with mean-field observability. We also show that the symmetry condition cannot be relaxed without loss of generality. Under narrower observation channels, in which the mean-field information is compressed before being observed by each agent, we show that the agent faces a POMDP rather than an MDP, even when its counterparts use symmetric policies.