September 12, 2022
2:00 – 3:00 pm
KAP 414

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Topics on Stackelberg Mean Field Game

Abstract: In this talk, I'm going to talk about two recents projects on Stackelberg Mean Field Game. First, we consider a discrete-time Stackelberg mean field game (SMFG) with one leader and an infinite number of homogeneous followers via optimization lense. Stackelberg game has attracted recent interest modeling an asymmetric, general sum game between leaders and followers. We focus on a robust setting where the followers have bounded rationality and only aim at achieving some ε-Nash equilibrium (NE) while the leader wants to maximize her objective in the worst case scenario among all ε-NEs. We study the sensitivity analysis when the leader only has access to some perturbed model. We show that the value function is unstable with respect to the perturbation of the model and the leader needs to be more pessimistic and solve a relaxed problem to obtain a near optimal solution. The analysis is done by formulating this SMFG problem into an explicit minimax optimization problem and studying the sensitivity property using the optimization framework.

Second, we investigate the existence of an optimal policy to monitor a mean field system of agents managing a risky project under moral hazard with accidents modeled by L´evy processes magnified by the law of the project. We provide a general method to find both a mean field equilibrium for the agents and the optimal compensation policy under general, sufficient and necessary assumptions on all the parameters. We formalize the problem as a bilevel optimization with the probabilistic version of a mean field game which can be reduced to a controlled McKean-Vlasov SDE with jumps. We apply our results to an optimal energy demand-response problem with a crowd of consumers subjected to power cut/shortage when the variability of the energy consumption is too high under endogenous or exogenous strains. In this example, we get an explicit solution to the mean field game and to the McKean-Vlasov equation with jumps.

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