Near-optimal distributed controls for high-dimensional stochastic systems - Beyond the Mean Field Setting

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In this talk, we will investigate large-population stochastic control problems in which agents share their state information and cooperate to minimize a convex cost functional. The latter is decomposed into individual and coupling costs, with the distinctive feature that the coupling term is a pairwise interaction function between the controls. To address this setting, we follow closely (Jackson & Lacker, 2025): we introduce a related problem where each agent observes only its own state. We then establish a quantitative bound on the difference between the value functions associated with these two problems. We obtain this result by reformulating the problems analytically as Hamilton-Jacobi type equations and comparing their associated Hamiltonians. The main difficulty of our approach lies in establishing a precise comparison between the distributions of the corresponding optimal controls.