November 28, 2022
2:00 – 3:00 pm
KAP 414

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Necessary and Sufficient Conditions for Optimal Control of
Semilinear Stochastic Partial Differential Equations

Abstract: In this talk, we consider a finite-horizon optimal control problem of stochastic reaction-diffusion equations. First we apply the spike variation method which relies on introducing the first and second order adjoint state. We give a novel characterization of the second order adjoint state as the solution to a backward SPDE. Using this representation, we prove the maximum principle for controlled SPDEs. As another application of our characterization of the second order adjoint state, we derive additional necessary optimality conditions in terms of the value function. These results generalize a classical relationship between the adjoint states and the derivatives of the value function to the case of viscosity differentials. The last part of the talk is devoted to sufficient optimality conditions. We show how the necessary conditions lead us directly to a non-smooth version of the classical verification theorem in the framework of viscosity solutions. This talk is based on joint work with Wilhelm Stannat [W. Stannat, L. Wessels, Peng's maximum principle for stochastic partial differential equations, SIAM J. Control Optim., 59 (2021), pp. 3552–3573] and [W. Stannat, L. Wessels, Necessary and Sufficient Conditions for Optimal Control of Semilinear Stochastic Partial Differential Equations, https://arxiv.org/abs/2112.09639, 2022]

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