February 22nd, 2016
KAP 414
2:00 P.M. – 3:00 P.M.

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"Solvable Stochastic Control and Stochastic Differential Games"

Abstract: Two general methods are typically available for the solution of stochastic control problems. These methods are the solutions of Hamilton-Jacobi-Bellman (HJB) equations and the solutions of backward stochastic differential equations (BSDEs). Since the HJB equations are nonlinear partial differential equations it is difficult to obtain explicit solutions to determine an optimal control. BSDEs typically obtained from the stochastic maximum principle are another approach to determining optimal controls. Since the solutions of these BSDEs require a forward measurability to a backward equation, it can be difficult to obtain explicit solutions. Likewise stochastic differential games are usually solved by the Hamilton-Jacobi-Isaacs equations or BSDEs. In this talk a direct method for solving control and differential game problems, that is motivated by the algebraic method of completion of squares, is shown to be applicable to many control and game problems. For linear-quadratic control or games the usual noise processes of Brownian motion

can be replaced by other stochastic processes having only relatively weak probabilistic and sample path properties. This direct method can also be applied to problems of control or games that evolve on some Riemannian manifolds induced by Lie groups such as spheres, projective spaces or hyperbolic spaces. Another solution method is given to obtain explicit results for control or game problems with exponential quadratic costs or payoffs and linear systems. Furthermore some problems of the control of linear stochastic partial differential equations (distributed parameter systems) with quadratic costs and fractional Brownian motion noise can be solved in a manner similar to the finite dimensional systems as well as linear SPDEs with a scalar multiplicative Gaussian noise.