# Mathematics Department Colloquium

Organizer(s): Kenneth Ribet

Thursday, 4:10–5:00pm, 60 Evans

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Feb. 12    **Xin Guo**, UC Berkeley, IEOR
*Multi-dimensional stochastic control problems and their regularity properties*

Many problems in engineering and economics are formulated in the impulse/singular control framework. Compared to regular controls, impulse control provides a more natural mathematical framework when the state space is discontinuous. However, many structural results amount to solving complex algebraic equations that are hard to verify without a priori knowledge of the regularity property, thus the correctness of the "solutions" is dubious. In this talk, we provide sufficient conditions for the smooth-fit $C^1$ property of the value function for multi-dimensional controlled diffusions, using a viscosity solution approach. This approach is different from the Quasi-Variational Inequalities (QVI) established by Bensoussan and Lions (1982). We show by simple examples where the regularity property may fail, especially in the multi-dimensional case.