

**April 13, 2015**  
**KAP 414**  
**2:00 pm- 3:00**

## **Prof. Huyen Pham** (University of Paris VII, Diderot)

### “Robust Feedback Switching Control Problem”

**Abstract:** We study a robust switching control problem where the controller only observes the evolution of the state process, and thus uses feedback (closed-loop) switching strategies, a non-standard class of switching controls introduced in this work. The adverse player, which can be interpreted as the nature, chooses open-loop controls that represent Knightian uncertainty, and misspecification of the model. The (half) game switcher/nature is then formulated as a two-step (robust) optimization problem.

In the first part of this talk, we present the stochastic Perron's method for this control problem, and prove that it produces a viscosity sub and super solution to a system of variational inequalities of Hamilton-Jacobi-Bellman-Isaacs (HJBI) type, such that the value function is squeezed between them. Together with a comparison principle, this characterizes the value function of the game as the unique viscosity solution to the HJBI equation, and shows as a byproduct the dynamic programming principle for robust feedback switching control problem.

The second part of the talk is devoted to the asymptotic behavior analysis for the HJBI equation, both parabolic and elliptic, arising from robust switching control problem. We prove that, as time horizon goes to infinity (resp. discount factor goes to zero) the long run average solution to the parabolic system (resp. the limiting discounted solution to the elliptic system) is characterized by a solution to a nonlinear system of ergodic variational inequalities. Our results hold under a dissipativity condition and without any non degeneracy assumption on the diffusion term. Our approach uses mainly probabilistic arguments and in particular a dual randomized game representation for the solution to the system of variational inequalities.

This is based on joint works with Erhan Bayraktar (University of Michigan) and Andrea Cosso (University Paris Diderot).