Stochastic optimization in a jump-diffusion model

In this talk, I will present a problem arising from optimizing dividend strategies for an insurance company exposed to natural catastrophe risk. The uncontrolled model is modeled as a jump process driven by a shot-noise Cox claim arrival mechanism. The optimal value function of the resulting two-dimensional stochastic control problem is shown to be the smallest viscosity supersolution of the associated Hamilton-Jacobi-Bellman (HJB) equation. This HJB equation involves a minimum between an integro-differential operator and a linear operator, giving rise to a free boundary problem that partitions the state space. In this work, we further show that the optimal value function can be uniformly approximated using a numerical scheme, and we illustrate this approach with examples.