Sequential Regression Methods for Optimal Stopping

Mike Ludkovski

Univ. of California at Santa Barbara

Abstract:
We propose a new approach to solve optimal stopping problems via simulation. Working within the backward dynamic programming/Snell envelope framework, we augment the methodology of Longstaff-Schwartz that focuses on approximating the stopping strategy. We reinterpret the corresponding partitions of the state space into the continuation and stopping regions as statistical classification problems with noisy observations. Accordingly, a key new objective that we pursue is efficient design of the stochastic grids formed by the simulated sample paths of the underlying state process. To this end, we introduce active learning schemes that adaptively place new grid points close to the stopping boundaries. We then discuss dynamic regression algorithms that can implement such recursive estimation and local refinement of the classifiers. The new algorithm is illustrated with a variety of numerical experiments, showing that an order of magnitude savings in terms of total grid size can be achieved. We also compare with existing benchmarks in the context of pricing multi-dimensional Bermudan options. (Joint work with R. Gramacy (Chicago)).