Contribution ID: **58** Type: **not specified**

# A Deep-Learning Approach to High-Dimensional Impulse Control with Applications to Inventory Management

*Friday, June 21, 2024 11:30 AM (30 minutes)*

We consider impulse control problems where the system controller can intervene in the state process by means of jumps in the underlying state space. So far, it has not been possible to efficiently solve these problems numerically in high dimensions due to the dreaded "curse of dimensionality."To tackle this challenge, we introduce a novel deep-learning framework. Grounded in the theory of backward stochastic differential equations (BSDEs), this framework relies crucially on probabilistic identities that exploit a deep connection between impulse control and stochastic target problems. We demonstrate the efficacy of our approach for a class of joint replenishment problems with Brownian demands, in which procurement fixed costs can be saved by replenishing a group of different types of items at a time.

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**Session Classification:** Parallel session: Reinforcement learning for real-life applications