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Practical Reinforcement Learning in Logistics

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Reinforcement learning is a variant on optimization, formulated as a Markov Decision Problem, and is seen as a branch of machine learning. CQM, a consultancy company, has decades of experience in Operations Research in logistics and supply chain projects. CQM performed a study in which reinforcement learning was applied to a logistics case on tank containers. Because of imbalanced flows, these containers need to be relocated all over the world between harbors. The challenge is about sending empty containers from i to j to deal with trading imbalances, such that random demand for containers at each of the harbors can be met as much as possible. Instead of reducing the problem to a deterministic one and subsequently optimize, reinforcement learning deals with the randomness inherently and considers cumulative rewards and costs, using a simulation model. A non-standard challenge is the extremely large dimension of the action space, which is not commonly addressed in literature on reinforcement learning. Employing several visualizations of aggregations of the scheme, comparing to benchmark methods, and applying statistical principles to robustness checks were performed as well. This study was carried out as part of the European project ASIMOV (<https://www.asimov-project.eu/>).

Keywords

reinforcement learning, robustness, logistics

Classification

Mainly application

Primary authors: BIKKER, Jan-Willem (CQM); DE RUITER, Frans (CQM)**Presenter:** BIKKER, Jan-Willem (CQM)**Session Classification:** CONTRIBUTED Machine Learning 2**Track Classification:** Machine learning