

Title: Generative Hyper-heuristics for Online Transportation Optimization Problems

Abstract:

Many real-life optimisation problems are intended for complex systems with limited predictability. Such systems are characterized by the large scale of the problem sizes, nonlinearity, multi-objectivity and uncertainties. In marine container terminals, truck dispatching optimization is often considered as the primary focus as it provides crucial synergy between the sea-side operations and yard-side activities and hence can greatly affect the terminal throughput and quay crane utilization. However, many existing studies rely on strong assumptions that often overlook the uncertainties and dynamics innate to real-life applications. In this talk, we investigated several learning based dynamic algorithms for transportation. Different from offline methods that search for full solutions directly, the proposed generative methods focus on obtaining a generative policy (heuristic) that makes more balanced decisions between two extremes: near-term greediness and long-term reward forecasts which are mostly over-optimistic under uncertainties. More specifically, the proposed generative policies take into account of both the immediate rewards/penalties of the chosen decision and the expected future rewards in future, albeit with a discount by a factor (<1) so that they carry relatively less weight in the decision making, hence mitigating the risks of over-optimism caused by most deterministic methods. This presentation shall report a deep reinforcement learning hyper-heuristic and a genetic programming ensemble hyper-heuristic method. Experiment studies show our proposed methods have good generalization and achieve the state-of-the-art results on the problems derived from real-life transportation problems.

Short Biography



Ruibin Bai is a professor and Head of the Artificial Intelligence and Optimisation (AIOP) group at the University of Nottingham Ningbo China. He also leads Ningbo Digital Port Technologies Key Lab. His main research interests include computational intelligence, reinforcement learning, digital twin, operations research, scheduling and optimisation with a special focus on transportation systems and port logistics. He has published over 100 academic papers and currently serves as Associate **Editor for European Journal of Operations**

Research and Networks. His work is recognized in industry through “Huawei Spark Award” in 2022. Under his leadership, his team has developed algorithms and software systems that have been commercialized in Ningbo Port and PingAn Good Doctor.