Research project and supervisory team

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Short introduction & description of research project	This project is dedicated to developing a generalized scheduling optimization method collaboratively driven by real-world operational data and expert experience, with traditional container terminals serving as the primary application scenario. Current complex scheduling environments, particularly in traditional terminals, face prominent challenges: inadequate spatiotemporal coordination, frequent routing conflicts, and high susceptibility to frequent disturbances such as variations in human driving behaviours, fluctuations in vessel arrivals, and equipment failures. Traditional scheduling approaches, which typically rely on operations research rules or single-driven paradigms, often struggle to adapt to such large-scale, highly dynamic, and uncertain real-world operational environments. The core objective of this research is to construct a scheduling optimization framework based on Agentic Reinforcement Learning (Agentic RL) to improve scheduling efficiency and enhance system robustness against disturbances in complex scenarios. Leveraging massive amounts of real operational data from terminals alongside the practical guidance of industry experts, this method establishes a dual-driven mechanism combining objective data and heuristic experience. Technically, it fully capitalizes on the advantages of Agentic RL in autonomous environmental perception, long-horizon planning, and decision-making. By integrating rational task allocation, real-time information exchange, and dynamic coordination among multiple agents, and by accurately characterizing the dynamic states and behavioral traits of scheduling entities (e.g., traditional human-driven container trucks), the system achieves real-time situational awareness, early prediction of disturbance risks, and adaptive decision-making. This effectively resolves the challenges of constraint coupling and the curse of dimensionality inherent in multi-task, multi-resource scenarios. This project is expected to establish a systematic, generalized scheduling theory and methodology framework collaboratively driven by data and experience, yielding a practically deployable solution. The outcomes will not only provide critical technical support for enhancing the collaborative efficiency, system stability, and risk-resistance of traditional human-driven container terminal operations in China, but the underlying Agentic RL framework and algorithmic models can also be efficiently transferred and adapted to other complex logistics and production scheduling domains.
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