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The Traveling Salesman Problem: Novel Approaches Grounded in Evolutionary Reinforcement Learning

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Deep Reinforcement Learning (DRL) has showcased remarkable achievements across various domains, such as image recognition and automation. Nevertheless, its potential in the realm of logistics and transportation, particularly in tackling routing challenges, remains mostly untapped. On the contrary, Evolutionary Algorithms (EA) have enjoyed widespread adoption for solving combinatorial optimization problems. Surprisingly, the amalgamation of EA and DRL techniques for addressing combinatorial optimization problems has received limited attention within existing literature.

Motivated by these research gaps, this study introduces an innovative approach known as Evolutionary Reinforcement Learning (ERL) to tackle the Traveling Salesman Problem (TSP). To enhance the policy generated by a deep neural network, we leverage the synergy between the EA and DRL frameworks. Notably, the weights associated with the actor component play a crucial role, especially in non-policy methods. Harnessing the power of EA, we create a population of weights and seamlessly incorporate them into the DRL framework, with the overarching objective of significantly enhancing TSP outcomes. We employed the Genetic Algorithm (GA) as the EA and introduced a novel ERL-based approach, namely the ERL-GA. The conducted computational experiments have demonstrated that the ERL-GA surpasses the basic DRL framework in terms of performance.

Primary authors: Prof. LAYEB, SAFA BHAR (LR-OASIS National Engineering School of Tunis, University of Tunis El Manar, Tunis, Tunisia); Mrs BENSLIMANE, Maryem (LR-OASIS National Engineering School of Tunis, University of Tunis El Manar, Tunis, Tunisia)

Presenter: Prof. LAYEB, SAFA BHAR (LR-OASIS National Engineering School of Tunis, University of Tunis El Manar, Tunis, Tunisia)

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