

## Applications of Evolutionary Optimization Methods in Reinforcement Learning

**Authors :** Rahul Paul, Kedar Nath Das

**Abstract :** The paradigm of Reinforcement Learning (RL) has become prominent in training intelligent agents to make decisions in environments that are both dynamic and uncertain. The primary objective of RL is to optimize the policy of an agent in order to maximize the cumulative reward it receives throughout a given period. Nevertheless, the process of optimization presents notable difficulties as a result of the inherent trade-off between exploration and exploitation, the presence of extensive state-action spaces, and the intricate nature of the dynamics involved. Evolutionary Optimization Methods (EOMs) have garnered considerable attention as a supplementary approach to tackle these challenges, providing distinct capabilities for optimizing RL policies and value functions. The ongoing advancement of research in both RL and EOMs presents an opportunity for significant advancements in autonomous decision-making systems. The convergence of these two fields has the potential to have a transformative impact on various domains of artificial intelligence (AI) applications. This article highlights the considerable influence of EOMs in enhancing the capabilities of RL. Taking advantage of evolutionary principles enables RL algorithms to effectively traverse extensive action spaces and discover optimal solutions within intricate environments. Moreover, this paper emphasizes the practical implementations of EOMs in the field of RL, specifically in areas such as robotic control, autonomous systems, inventory problems, and multi-agent scenarios. The article highlights the utilization of EOMs in facilitating RL agents to effectively adapt, evolve, and uncover proficient strategies for complex tasks that may pose challenges for conventional RL approaches.

**Keywords :** machine learning, reinforcement learning, loss function, optimization techniques, evolutionary optimization methods

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