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Fuzzy Ex-RL: Fuzzy Experience-Based Reinforcement Learning

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Abstract

Reinforcement Learning has proven to be a robust approach for addressing sequential decision-making problems, finding significant applications in both academic research and industry. However, RL algorithms often struggle with adaptability when there are slight changes in environmental parameters. Transfer Learning offers a promising solution by utilizing prior knowledge to expedite and improve the RL learning process under such conditions.

To address these challenges, we introduce Fuzzy Ex-RL, an enhancement of the Ex-RL algorithm[**?**] that incorporates fuzzy models to improve transfer learning capabilities. Fuzzy Ex-RL is designed to handle the elasticity in patterns, thereby effectively mapping experiences with differing skewness. This method is showing significant improvements in both success rate and sample efficiency. Our results indicate that Fuzzy Ex-RL achieves approximately a 60% increase in success rate and improvement in sample efficiency compared to traditional RL methods. Moreover, in transfer learning scenarios, Fuzzy Ex-RL outperforms the original Ex-RL by about 25%.

Keywords: Reinforcement Learning, Transfer Learning, and Experience-based learning

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