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Reinforcement Learning for Adaptive Cognitive Sensor Networks

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Abstract: *In this paper, we propose an adaptive cognitive sensor network (CSN) system utilizing reinforcement learning (RL) to optimize network performance dynamically. The RL-based system adjusts key parameters such as transmission power, channel selection, and data scheduling based on real-time environmental feedback, thereby enhancing energy efficiency, spectrum utilization, and data accuracy. A Q-learning algorithm is employed to train the RL agent, which operates under an ϵ-greedy policy to balance exploration and exploitation. Comparative analysis with traditional static and rule-based systems demonstrates significant improvements across all key performance metrics. Future enhancements are suggested, including advanced RL techniques, transfer learning, and real-world deployments, highlighting the potential of RL in transforming CSNs into more intelligent, efficient, and resilient networks*

Keywords: Reinforcement Learning, Cognitive Sensor Networks, Q-learning, ϵ\epsilonϵ-greedy policy, Energy Efficiency, Spectrum Utilization, Data Accuracy, Adaptive Networks, Dynamic Optimization, Machine Learning

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