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Effectiveness of Reinforcement Learning (RL) for Autonomous Energy Management Solutions

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Abstract : This thesis aims to investigate the effectiveness of Reinforcement Learning (RL) for Autonomous Energy Management solutions. The study explores the potential of Model Free RL approaches, such as Monte Carlo RL and Q-learning, to improve energy management by autonomously adjusting energy management strategies to maximize efficiency. The research investigates the implementation of RL algorithms for optimizing energy consumption in a single-agent environment. The focus is on developing a framework for the implementation of RL algorithms, highlighting the importance of RL for enabling autonomous systems to adapt quickly to changing conditions and make decisions based on previous experiences. Moreover, the paper proposes RL as a novel energy management solution to address nations' CO2 emission goals. Reinforcement learning algorithms are well-suited to solving problems with sequential decision-making patterns and can provide accurate and immediate outputs to ease the planning and decision-making process. This research provides insights into the challenges and opportunities of using RL for energy management solutions and recommends further studies to explore its full potential. In conclusion, this study provides valuable insights into how RL can be used to improve the efficiency of energy management systems and supports the use of RL as a promising approach for developing autonomous energy management solutions in residential buildings.

Keywords : artificial intelligence, reinforcement learning, monte carlo, energy management, CO2 emission
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