

Adaptive Feature Selection in Dynamic Environments using Reinforcement Learning

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Abstract: *Feature selection is a critical step in developing efficient and interpretable machine learning models, especially in dynamic environments where data characteristics evolve over time. Traditional feature selection methods often fail to adapt to these changes, leading to suboptimal performance. In this paper, we propose a novel framework for adaptive feature selection based on reinforcement learning (RL). The framework employs an RL agent to iteratively select and refine the subset of features most relevant to the current task, dynamically adapting to variations in the data distribution. We evaluate our approach across a range of datasets, including synthetic benchmarks and real-world applications in finance, healthcare, and sensor networks. Results demonstrate that our method consistently outperforms traditional feature selection techniques, achieving improved accuracy and reduced computational cost. Moreover, our framework provides interpretability by identifying feature relevance patterns over time, offering valuable insights into underlying data dynamics. This research opens new pathways for deploying machine learning models in real-time, adaptive systems.*

Keywords: Feature selection