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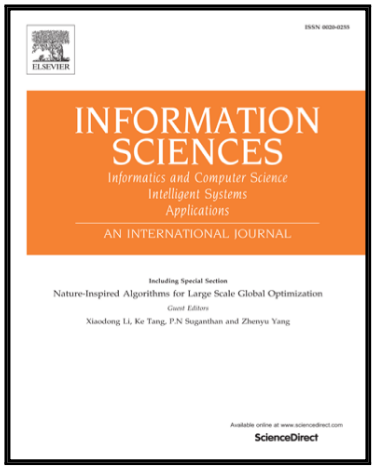

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A Scheduling Scheme in the Cloud Computing Environment Using Deep Q-learning

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Abstract

Task scheduling, which plays a vital role in cloud computing, is a critical factor that determines the performance of cloud computing. From the booming economy of information processing to the increasing need of quality of service (QoS) in the business of networking, the dynamic task-scheduling problem has attracted worldwide attention. Due to its complexity, task scheduling has been defined and classified as an NP-hard problem. Additionally, most dynamic online task scheduling often manages tasks in a complex environment, which makes it even more challenging to balance and satisfy the benefits of each aspect of cloud computing. In this paper, we propose a novel artificial intelligence algorithm, called deep Q-learning task scheduling (DQTS), that combines the advantages of the Q-learning algorithm and a deep neural network. This new approach is aimed at solving the problem of handling directed acyclic graph (DAG) tasks in a cloud computing environment. The essential idea of our approach uses the popular deep Q-learning (DQL) method in task scheduling, where fundamental model learning is primarily inspired by DQL. Based on developments in WorkflowSim, experiments are conducted that comparatively consider the variance of makespan and load balance in task scheduling. Both simulation and real-life experiments are conducted to verify the efficiency of optimization and learning abilities in DQTS. The result shows that when compared with several standard algorithms precoded in WorkflowSim, DQTS has advantages regarding learning ability, containment, and scalability. In this paper, we have successfully developed a new method for task scheduling in cloud computing.