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Review on Quantum ML Workload Prediction and Categorization in Cloud Computing

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Abstract: *The rapid advancement of cloud computing has enabled large-scale deployment of machine learning applications; however, the emergence of Quantum Machine Learning (QML) introduces new challenges for cloud workload management. QML workloads exhibit unique execution patterns, hybrid quantum–classical behavior, and distinct resource requirements that are not effectively handled by existing cloud workload prediction and scheduling mechanisms. This paper presents a comprehensive review of recent research on cloud workload optimization, scheduling, and characterization, highlighting their limitations in supporting QML workloads. Based on the identified research gaps, a system model and methodology for QML workload prediction and categorization in cloud computing environments are discussed. The proposed approach emphasizes early workload analysis, feature-based prediction, and intelligent categorization to enable proactive scheduling and efficient resource utilization. Furthermore, key challenges related to quantum hardware limitations, hybrid integration complexity, and prediction reliability are analyzed. This study provides foundational insights for designing scalable and intelligent cloud platforms capable of supporting next-generation Quantum Machine Learning applications.*

Keywords: Quantum Machine Learning, Cloud Computing, Workload Prediction, Workload Categorization, Hybrid Quantum–Classical Systems, Cloud Scheduling, Resource Management

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