

# Advanced Scheduling Techniques for Distributed Machine Learning Systems

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**Abstract:** *Distributed machine learning systems have become essential for training increasingly complex models on massive datasets. As data volumes continue to grow, scheduling emerges as a bottleneck affecting model accuracy, training efficiency, and resource utilization. This review paper provides a comprehensive analysis of advanced scheduling techniques designed for distributed ML environments, including cluster-aware scheduling, adaptive resource allocation, heterogeneity-aware scheduling, task-parallel models, reinforcement learning-based schedulers, and energy-efficient scheduling. The paper discusses challenges, performance trade-offs, and emerging trends shaping the future of DML scheduling.*

**Keywords:** Distributed training, Task scheduling, Resource-aware scheduling