

Collaborative Learning and Optimization

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Abstract

Machine learning (ML) and optimization are two fundamental missions of Computational Intelligence (CI). Numerous CI techniques for ML and optimization have been developed, with deep neural networks (for ML) and evolutionary algorithms (for optimization) being among the most prominent examples. Although ML and optimization have traditionally been studied as two distinct research areas, they are intrinsically interconnected. On the one hand, ML involves various model-centric and data-centric optimization tasks. On the other hand, optimization can often benefit from ML-assisted search and decision-making. Exploring the synergy between ML and optimization, known as Collaborative Learning and Optimization (COLO), particularly through CI techniques, therefore offers significant opportunities to advance both fields. This talk will introduce the fundamentals, recent advances, and future perspectives of CI-based COLO from three aspects: Learning for Optimization (Learn4Opt), which leverages ML techniques to assist optimization; Optimization for Learning (Opt4Learn), which employs optimization techniques to facilitate ML; and Integrated Learning and Optimization (LearnOpt), which synergistically integrates ML and optimization to address real-world problems in which ML and optimization are involved as two indispensable and intertwined tasks.



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