A multi-objective optimization framework for decentralized learning with coordination constraints

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Abstract

In this talk, we describe a generalized framework for Decentralized Learning formulated as a Multi-Objective Optimization problem, in which both agents and a central coordinator contribute independent, potentially conflicting objectives over a shared model parameter space. We explore scalarization strategies to construct tractable surrogate problems. These yield solutions that are provably Pareto optimal under standard convexity and smoothness assumptions. In addition, we propose a decentralized optimization algorithm with convergence guarantees and demonstrate its empirical performance through simulations, highlighting the impact of the coordinator's influence on local agent behavior.

This is a joint work with Umberto Biccari (U. Deusto) and you can find a preprint version of this work at [1].

References

[1] U. Biccari and R. Morales. A multi-objective optimization framework for decentralized learning with coordination constraints. *arXiv preprint arXiv:2507.13983*, 2025.

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