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Constrained consensus-based optimization via penalization

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Constrained optimization problems represent a challenge when the objective function is non-differentiable, multimodal and the feasible region lacks regularity. In our talk, we will introduce a swarm-based optimization algorithm which is capable of handling generic non-convex constraints by means of a penalization technique. The method extends the class of consensus-based optimization (CBO) methods to the constrained settings, a class where a swarm of interactive particles explores the objective function landscape following a consensus dynamics.
In our algorithm, we perform a time discretization of the system evolution and tune the parameters to effectively avoid non-admissible regions of the domain. While the particle dynamics may appear simple, recovering convergence guarantees represents the real difficulty when dealing with swarm-based methods. In the talk, we will present the essential mean-field tools that allowed us to theoretically analyze the algorithm and obtain convergence results of its mean-field counterpart under mild assumptions. To conclude, we will discuss both the algorithm performance on benchmark problems and numerical experiments of the mean-field dynamics.

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