# Bernoullis Tafelrunde

Graduate Student Seminar

**Monday, 18 December 2023, 12:15-13:00**
Seminarraum 05.002, Spiegelgasse 5

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# Cubic Regularized Subspace Newton for Non-convex Optimization

Abstract

This paper addresses the optimization problem of minimizing non-convex continuous functions, which is relevant in the context of high-dimensional machine learning applications characterized by over-parametrization. We analyze a variant of coordinate descent named SSCN that leverages second-order information to speed up convergence. While previous work focused on convex functions, we establish theoretical convergence guarantees for non-convex cases, demonstrating an $\mathcal{O}(\epsilon^{-3/2}, \epsilon^{-3})$ convergence to an $\epsilon$-second-order stationary point, and up to a ball whose radius depends on the number of sampled coordinates. Additionally, we propose an adaptive sampling scheme ensuring exact convergence at the cubic regularization (CR) rate, even without sampling all coordinates. Experimental results substantiate the substantial speed-ups achieved by SSCN compared to conventional first-order methods.