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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

PhD Student Seminar

Weighted Riemannian Optimizations for Phase Retrieval

By

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Abstract

We propose a Riemannian Gradient Descent method but under a newly defined metric that exploits the low-rank structure of the phase retrieval problem, based on the embedded manifold of rank-1 positive semidefinite matrices. The theoretical guarantee of this method relies on the restricted well-conditioned property and the restricted weak correlation property of the truncated linear operator. However, the restricted property is not always well-established under traditional Riemannian methods. To overcome this issue, we propose a new weighted metric that leads to an ideal restricted well-conditioned property, similar to the RIP condition, and results in a better convergence rate. We focus on two types of Phase Retrieval Problems - under Gaussian measurement and measurements of Fourier transforms with complex random masks. We present two Riemannian optimization algorithms, Riemannian Gradient Descent algorithm (RGrad) and Riemannian Conjugate Gradient Descent algorithm (RCG), to solve such problems from these special but widely-used measurements in practical applications. Finally, we provide several empirical experiments that demonstrate the effectiveness and stability of our algorithms compared with the Wirtinger Flow (WF) algorithm and the Riemannian Gradient Descent algorithm under the Euclidean metric.

Date : 3 May 2023 (Wednesday)
Time : 4:45pm
Venue: Room 3598 (near Lifts 27/28)

All are Welcome!