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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

No existence of a linear algorithm for Fourier phase retrieval

By

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Abstract

Fourier phase retrieval, which aims to reconstruct a signal from its Fourier magnitude, is of fundamental importance in engineering and scientific fields. In this talk, we provide a theoretical understanding of algorithms for the one-dimensional Fourier phase retrieval problem. Specifically, we demonstrate that if an algorithm exists that can reconstruct an arbitrary signal $\vx\in \C^N$ in $\mbox{Poly}(N) \log(1/\epsilon)$ time to reach ϵ-precision from its magnitude of discrete Fourier transform and its initial value $x(0)$, then $\mathcal{ P}=\mathcal{NP}$. This partially elucidates the phenomenon that, despite the fact that almost all signals are uniquely determined by their Fourier magnitude and the absolute value of their initial value $|x(0)|$, no algorithm with theoretical guarantees has been proposed in the last few decades. Our proofs employ the result in computational complexity theory that the Product Partition problem is NP-complete in the strong sense.

Date : 30 May 2024 (Thursday)

Time : 3:00p.m.-4:00p.m.

Venue : Room 2129C (near Lift 19)

All are Welcome!