THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON DATA SCIENCE AND APPLIED MATHEMATICS

Mathematical and Algorithmic Problems in 3-D Reconstruction: Robustness, Computational Bottlenecks and Solutions

By

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Abstract

The group synchronization problem asks to recover group elements, such as 3-D rotations and permutations, on graph nodes from their relative measurements on graph edges. It has critical applications in 3-D reconstruction and many other tasks in data science. It is challenging due to highly corrupted measurements and computational bottlenecks. This talk will demonstrate how to overcome these challenges in a unified framework that applies to all compact groups. The proposed solution is a message passing algorithm that utilizes the cycle consistency of group elements within the graph. The talk will also present several exact recovery guarantees by the proposed method under both adversarial and uniform corruption and demonstrate state-of-the-art accuracy and speed of the proposed method. This new framework may provide a foundation for a next generation of 3-D reconstruction pipeline. The talk will further expand on different developments in 3-D reconstruction of protein molecules via cryo-electron microscopy (cryo-EM).

Biography
Yunpeng Shi is a postdoc research associate in applied math at Princeton working with Prof. Amit Singer. He got his phd in math from University of Minnesota in 2020 under the supervision of prof. Gilad Lerman. His research focuses on robust and scalable methods for 3-D reconstruction.

Date	**:**	**23 March 2023 (Thursday)**
Time	**:**	**11:00am**
Venue	**:**	**Room 1104 (near Lift 19)**

All are Welcome!