THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

MATHEMATICS COLLOQUIUM

Masser's Conjecture on Equivalence of Integral Quadratic Forms

By

Prof. Han LI

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Abstract

In the realm of quadratic forms theory, a fundamental problem lies in determining the equivalence of two given integral quadratic forms. This problem, framed in terms of matrices, seeks to ascertain whether there exists a unimodular integral matrix X that satisfies the equation A=X'BX, where A and B are given symmetric n-by-n integral matrices, and X' denotes the transpose of X. While a straightforward decision procedure exists for definite forms, the situation is more complex for indefinite forms. Surprisingly, it wasn't until the early 1970s, with the work of C. L. Siegel, that a solution was found for indefinite forms. In the late 1990s, D. W. Masser conjectured the existence of a polynomial search bound for X in terms of the heights of A and B, for n greater than or equal to 3. The goal of this presentation is to discuss our resolution of this conjecture, achieved jointly with Professor Gregory A. Margulis. Our approach involved translating the problem into one concerning the actions of Lie groups on homogeneous spaces, and subsequently solving it using tools from ergodic theory, harmonic analysis, and representation theory. No prior background in Lie groups will be assumed for this talk.

Biography:
Han Li earned his PhD from Yale University in 2014. Presently, he serves as an Associate Professor of Mathematics at Wesleyan University, having previously held a postdoctoral position at the University of Texas at Austin. His research focuses on dynamics on homogeneous spaces of Lie groups with applications to number theory. His work has received support from grants provided by the National Science Foundation of the US and the Simons Foundation.

> **Date** : **14 June 2024 (Friday)**
> **Time** : **3:00pm – 4:00pm**
> **Venue** : **Lecture Theater F (Lifts 25/26)**

All Are Welcome!