

THE UNIVERSITY



OF HONG KONG

*Department of Mathematics*

## Colloquium

# Moments, shifted sums, and lacunary sums beyond $GL(2)$

**Dr. Wing Hong LEUNG**

Department of Mathematics, Rutgers University

### **Abstract**

Moments of the Riemann zeta function play a central role in understanding the distribution of primes. Classical work of Hardy–Littlewood and Ingham established the asymptotics of the second and fourth moments nearly a century ago, yet the sixth moment remains out of reach. These moments are connected to the shifted sum problem of divisor functions, and the main obstacle is that we cannot analyze shifted sums beyond  $GL(2)$ . In this talk, I will present some recent progress towards overcoming this barrier. I will first describe some results on the  $GL(3)$  shifted sum. Then I will introduce a new method to tackle shifted sums beyond  $GL(2)$ . This method relies on a novel reinterpretation of the Duke–Friedlander–Iwaniec delta method, and we apply it in a joint work with Matthew Young to study the shifted sum of Siegel modular forms on  $Sp(4)$ . Finally, we move towards another direction beyond the  $GL(2)$  shifted sum, landing us in the territory of lacunary sums. I will describe an upcoming joint work with Mayank Pandey on the sum of  $GL(2)$  coefficients over binary quartics with a power-saving error term.

Date: January 28, 2026 (Wednesday)

Time: 9:30 – 11:00 am

Venue: Room 210, Run Run Shaw Bldg., HKU

*All are welcome*