*For Favour of Posting*

Department of Mathematics
**The Chinese University of Hong Kong**

數學系
香港中文大學

Phone: (852) 3943 7988-9 • Fax: (852) 2603 5154 • Email: dept@math.cuhk.edu.hk
Rm. 220, Lady Shaw Building, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

# Representation and Number Theory Seminar

# *Borcherds algebras and Nakajima quiver varieties*

***by***

## *Professor Ben Davison*

***University of Edinburgh***

**Abstract**

Nakajima quiver varieties are a class of combinatorially defined moduli spaces generalising the Hilbert scheme of points in the plane, defined with the aid of a quiver $Q$ (directed graph) and a fixed framing dimension vector $f$. In the 90s Nakajima used the cohomology of these varieties (in fixed cohomological degrees, and for fixed $f$) to construct irreducible lowest weight representations of the Kac-Moody Lie algebras associated to the underlying graph of $Q$. Since the action is via geometric correspondences, the entire cohomology of these quiver varieties forms a module for the same Kac-Moody Lie algebras, suggesting the question: what is the decomposition of the entire cohomology into irreducible lowest weight representations?

In this talk, I will explain that this question is somehow not the right one. I will introduce the BPS Lie algebra associated to $Q$, a generalised Kac-Moody Lie algebra associated to $Q$, which contains the usual one as its cohomological degree zero piece. The entire cohomology of the sum of Nakajima quiver varieties for fixed $Q$ and $f$ turns out to have an elegant decomposition into irreducible lowest weight modules for this Lie algebra, with lowest weight spaces isomorphic to the intersection cohomology of certain singular Nakajima quiver varieties. This is joint work with Lucien Hennecart and Sebastian Schlegel Mejia.

**Date : 11 April 2023 (Tuesday)**

**Time : 4:00pm – 5:30pm**

**Venue : Room 502a, Academic Building I, CUHK**

*All are Welcome*