NCCR Swissmap presents

Representation Theory Day at EPFL

July 23, 2019

Room GC D0 386

13:30 – 14:30 Alexander Elashvili (Razmadze Institute, Georgia)

Semisimple cyclic elements in semisimple Lie algebras

The subject of the talk is the work of Vinberg, Kac, Jibladze and the author concerning current developments in the theory of cyclic elements in semisimple Lie algebras. The notion of cyclic element was introduced in 1959 by B. Kostant, who associated with the principal nilpotent a cyclic element and proved that it is regular semisimple.

In the paper "Cyclic elements in semisimple Lie algebras" by Vinberg, Kac and Elashvili (Transformation Groups v.18 no1, 2013) we classified all nilpotents giving rise to semisimple (as well as regular semisimple) cyclic elements.

Presently Kac, Jibladze and Elashvili continue the study of cyclic elements in semisimple Lie algebras. We classify semisimple cyclic elements in terms of various nonassociative algebra structures on certain subspaces of the corresponding Lie algebra. Importance of such classification stems from the fact that each such element gives rise to an integrable hierarchy of Hamiltonian PDE of Drinfeld-Sokolov type.

15:00 – 16:00 Anne Dranowski (University of Toronto, Canada)

Mirkovic-Vilonen cycles from generalized orbital varieties for Mirkovic-Vybornov slices

Representations constructed from the geometry of homogeneous spaces involve many choices, so we would like to parametrize coarse invariants, like dimensions of weight spaces of irreducible representations, by combinatorial objects. A classical example is the Grothendieck-Springer resolution of the variety of nilpotent elements $\mathcal{N} \subset \mathrm{Lie}(GL_n\mathbb{C})$. The top Borel-Moore homology of a fibre of this resolution is an irreducible representation of the symmetric group, and a basis is parametrized by Young tableaux. This talk will showcase a more modern example: torus-equivariant cohomology of nilpotent orbits in Slodowy slices. We will explain the representation theory and combinatorics of this example, and, under the magnifying glass of a finer geometric invariant known as the Duistermaat-Heckman measure, we will see that not all bases are created equal.