Theoretical Statistics and Mathematics Unit, Kolkata
INDIAN STATISTICAL INSTITUTE

SEMINAR

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VENUE:

L - 2

(4th Floor, A.N. Kolmogorov Bhavan), ISI Kolkata

TITLE:

Dynkin's result beyond finite type and combinatorics of the embedding problem for Kac--Moody Lie algebras.

SPEAKER:

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ABSTRACT:

Given a symmetrizable Kac–Moody Lie algebra g, it is natural to ask what are all the symmetrizable Kac–Moody Lie algebras g' so that we have a graded embedding g'--> g? In this talk, we will focus on embeddings where the image of the derived ideal of g' is isomorphic to a subalgebra of g generated by real root vectors, known as root-generated subalgebras. Dynkin proved that for finite-dimensional semisimple Lie algebras, there exist bijections between root-generated subalgebras, closed subroot systems and π-systems (generalized simple systems) containing positive roots. Therefore, π-systems and closed subroot systems arise naturally in the embedding problem. Moreover, it is well known that the subroot systems of a root system correspond bijectively with the reflection subgroups of the corresponding Weyl group. For symmetrizable Kac–Moody Lie algebras, Naito and Morita proved in the early 1990s that linearly independent π-systems lead to embeddings. We prove that every real closed subroot system admits a unique π-system containing positive roots, albeit the associated π-system can be infinite (hence linearly dependent). Nonetheless, we prove that the exact analogue of Dynkin's result holds and describe a presentation of root generated subalgebras. This implies that only those closed subroot systems with an associated linearly independent π-system appear in the embeddings. This characterizes the graded embeddings for the symmetrizable Kac--Moody Lie algebras. This work is joint with Deniz Kus and R. Venkatesh.

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