

TSSTS 2020 Mathematics Division
MA233: Representations of Lie Algebras

Guide to Course

DAINING XIAO

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Introduction

Lie groups are groups of continuous symmetries whereas Lie algebras are the linearisations of these groups, both of which are widely used in theoretical physics, algebraic geometry and topology. One may need no more than linear algebra and rudiments of abstract algebra to understand and describe the representations of some Lie algebras, namely how the algebras act on suitable vector spaces, then shedding light on the originating groups.

This short 12-hour reading course serves as an introductory study resource for the theory of the representations of Lie groups and Lie algebras, with a specific focus on \mathfrak{gl}_n , the Lie algebra of finite-dimensional general linear group, closely following [1]. No originality is claimed, and the use and distribution of any of the course materials should be of educational purposes only.

Schedule

Introduction & Motivation	[3]
Basic theory of modules over Lie algebras	[5]
\mathfrak{gl}_2 modules, integral \mathfrak{gl}_n modules	[4]

Bibliography

- [1] A. Henderson, *Representations of Lie Algebras, An Introduction Through \mathfrak{gl}_n* , CUP, 2012
- [2] D. Bump, *Lie Groups* (2nd Ed.), Springer, 2013
- [3] Jean-Pierre Serre, *Complex Semisimple Lie Algebras*, Spinger, 1987