MATH-429 : Representation Theory II
Lie groups and algebras

This is a standard course on Lie groups, Lie algebras and their representations (see the week-by-week list of topics at the end of this document).

Time and place

- Lecture: Wednesdays 8:15 - 10:00 in MA A1 10
- Exercise Session: Wednesdays 10:15 - 12:00 in MA A1 10

Instructors

- Lecturer: Andrei Neguț
- Teaching Assistant: Niccolò Giacomini

Grading: 85% written final exam (Monday 16/06, 09:15-12:15 in CM 1 121)
15% mid-semester written assignment (DUE in class on May 7)

Moodle: https://go.epfl.ch/MATH-429

Every week before class, you may find on Moodle the lecture notes for the upcoming class, as well as the problem sheet to be used in the upcoming exercise session. We also use the Ed Discussion forum, and we encourage people to ask questions publicly (either anonymously or not).

Prerequisites: MATH-211 (group theory)
MATH-314 (representation theory I - finite groups)

Textbooks: Lecture notes will be provided; for additional help, we suggest

- J. Humphreys, "Introduction to Lie Algebras and Representation Theory"
- W. Fulton, J. Harris, "Representation Theory: A first course"

- D. Bump, "Lie Groups"
- A. Baker, "Matrix Groups: An Introduction to Lie Group Theory"

Language: English.

List of topics (subject to slight changes):

1. (Feb 19): Lie groups and Lie algebras
2. (Feb 26): Representations of Lie groups and Lie algebras
3. (Mar 5): The Lie group - Lie algebra correspondence
4. (Mar 12): Compact Lie groups. Complexification and real forms.
5. (Mar 19): The representation theory of $\mathfrak{sl}_2$
6. (Mar 26): The PBW theorem. Solvable and nilpotent Lie algebras
7. (Apr 2): Radicals and forms. Reductive and semisimple Lie algebras
8. (Apr 9): Abstract properties of semisimple Lie algebras
9. (Apr 16): Explicit description of semisimple Lie algebras
10. (Apr 30): Abstract root systems
11. (May 7): Dynkin diagrams and classification
12. (May 14): Semisimple Lie algebras by generators and relations
13. (May 21): Representation theory of semisimple Lie algebras
14. (May 28): Characters and the Weyl character formula