IAP 2014: DIRECTED READING PROGRAM

REPRESENTATION THEORY OF FINITE GROUPS AND LIE ALGEBRAS

Classes: WFS 12:00-14:00, Room E17-306

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This intense course will be devoted to the basic aspects of the representation theory of finite groups and Lie algebras.

In the first half of the course we will study the classical results on the representation theory of finite groups, including the character theory. We will conclude this discussion by classifying all irreducible representations of the symmetric group S_n and the alternating group A_n, and by discussing the Schur-Weyl duality. As an optional material, we will also derive the character table for the groups $GL_2(\mathbb{F}_q)$ and $SL_2(\mathbb{F}_q)$.

In the second part of the course, we will go over the basic notions of a Lie group and a Lie algebra. We will discuss classical results on Lie algebras, such as Engel's and Lie's theorems, the Campbell-Hausdorff formula, and the Jordan decomposition. We will conclude the class by a classification of complex simple Lie algebras and the Weyl character formula.

There are no official requirements to pass the course. However, it is highly recommended to do homework, which will consist of particular exercises from Fulton-Harris [1] and will be posted on the course website. There will be also a final home exam.

The literature for the course is:

[1] W. Fulton and J. Harris, *Representation Theory: A First Course*, book.

[2] P. Etingof et al., *Introduction to representation theory*, arXiv/0901.0827.