

Modular Representations of the Special Linear Groups over a Finite Field

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Abstract: Symmetry exists around us, and the set of symmetries forms a group. Representation theory is the study of linear group actions. The modular representations of a group are the representations over the field with characteristic $p > 0$, p a prime. This poses a different problem than studying the ordinary representations over the complex field \mathbb{C} . Around 1940, Richard Brauer had a pivotal role in developing the modular representation theory to study the classification of simple finite groups. Presently, it has far reaching applications. This includes, but not restricted to the study of Langlands Problem, the so-called grand unified theory of Mathematics.

The problems in modular representation theory become more interesting when the characteristic p of the field on which the representations are defined, divides the order of the group. Special linear groups are groups of matrices with determinant 1, and of finite order if they are defined over a finite field. The overarching goal is to describe all the irreducible modular representations of such a group, explicitly, i.e., as vector spaces. In this talk, we will explore some time-honored methods and some new techniques to achieve our goal.

Biography: Devjani is a fifth year PhD student of Mathematics at SIUC. Her research interest lies primarily in representation theory but encompasses number theory and algebraic geometry. Presently, she is writing her PhD thesis under the supervision of Prof. Kwangho Choi. She likes to read popular science books, and find applications of representation theory in Quantum Physics. She is mostly found talking about Calculus to undergrads.