Twisted Homogeneous Racks Over the Alternating Groups

Vulakh, Joseph (School: Paul Laurence Dunbar High School)

An important step towards the classification of finite-dimensional pointed Hopf algebras, which are algebraic structures with a wide range of fundamental applications to mathematics and physics, is the classification of finite-dimensional Nichols algebras arising from braided vector spaces of group type. This question is fundamentally linked with the structure of simpler algebraic objects called racks. Of particular interest to this classification is the type D condition on racks, a sufficient condition for a rack to not be the source of a finite-dimensional Nichols algebra. In this project, the type D condition in simple racks arising from the alternating groups was studied. Several families of twisted homogeneous racks arising from alternating groups are shown to be of type D, expanding upon previous work in this direction. This is important progress towards a general classification of twisted homogeneous racks of type D, and ultimately towards a classification of finite-dimensional pointed Hopf algebras.

Awards Won:
Fourth Award of $500
American Mathematical Society: Honorable Mention and One-Year Membership to AMS (for 5 projects with up to 3 team members per project)
National Security Agency Research Directorate : Second Place Award “Mathematics”