Speaker: Alireza Golsefidy

Title: Spectral gap in perfect algebraic groups over prime fields

Abstract: Suppose G is a connected algebraic $\mathbb{Q}$-group which is perfect; that means $G = [G, G]$. Let H be the largest semisimple quotient of G. We show that a family of Cayley graphs of $G(F_p)$ is a family of expander graphs if and only if their quotients as Cayley graphs of $H(F_p)$ form a family of expanders. This work extends a result of Lindenstrauss and Varju where they prove a similar statement for the group of special affine transformations. In combination with a result of Breuillard and Gamburd, one gets new families of finite groups with strong uniform expansion.

In the talk after defining the relevant terms, we discuss the method developed by Bourgain and Gamburd for studying random walks in finite groups. Roughly this method says in the absence of large approximate subgroups in a group G, a random walk in G has spectral gap if it can gain an initial entropy and has a Diophantine property. Next in the talk it will be explain why in our problem we only need to prove the needed Diophantine property. I will present how certain exponential cancellations, uniform convexity of $\mathcal{L}^p$-spaces, and a type of hypercontractivity inequality can help us obtain such a Diophantine property.

This is joint work with Srivatsa Srinivas.