LisMath Seminar Day, July 15, 2019

Venue: FCUL, Department of Mathematics, room 6.2.33

Schedule/Topics

- 14h - 14h30: Pedro Matos (FCUL)

  `On Gelfand-Graev type characters of unit groups arising from finite algebras`

- 14h30 - 15h00: Nguyen Bin (IST)

  `Surfaces of general type with canonical map of high degree`

- 15h00 - 15h30: David García-García (FCUL)

  `Schur averages in random matrix ensembles`

- 15h45 - 16h15: Tânia Silva (FCUL)

  `Finding a nice supercharacter theory for the Sylow p-subgroups of the symmetric group`

- 16h15 - 16h45: Davide Polini (IST)

  `Classifying and counting N=2 black holes`

- 16h45 -17h15: Jocelyn Lochon (FCUL)

  `A Supercharacter Theory for approximately finite algebra groups`

Titles/Speakers/Abstracts:

- `On Gelfand-Graev type characters of unit groups arising from finite algebras`

  `Speaker:` Pedro Matos (FCUL)

  `Abstract:`

  Our work is divided in two parts: the first part explores the induction of supercharacters from $U_n(q)$ to $GL_n(q)$ as a possible generalization of the Gelfand-Graev character, as well as some related problems which were posed during our research; the second part explores the possibility of adapting Gelfand and Graev's construction to finite groups arising as the units of a finite dimensional unital algebra over some finite field.

- `Surfaces of general type with canonical map of high degree`

  `Speaker:` Nguyen Bin (IST)

  `Abstract:`

  The study of the canonical map of surfaces of general type is a classical subject in the theory of algebraic surfaces. The canonical map was first studied by A. Beauville in 1979. He proved that if the image of the canonical map of a minimal surface of general type is a surface, this surface either has geometric genus zero (I) or is canonically embedded (II). Furthermore, he showed that the degree of the canonical map is less than or equal to 36. In the last decade, the problem of constructing examples of surfaces of general type with canonical map of high degree has been studied by many authors. Nonetheless, there still remain many questions left open. In this talk, we present some new examples of surfaces with non-birational canonical map in two classes (I), (II).

- `Schur averages in random matrix ensembles`

  `Speaker:` David García-García (FCUL)

  `Abstract:`

  There is a well known relation between matrix integrals over the classical Lie groups and the determinants of Toeplitz and Hankel matrices. We generalize this connection to the averages of Schur polynomials over these groups, which correspond to the minors of the underlying Toeplitz and Hankel matrices. We will show how this approach can be exploited to obtain several results in the theory of symmetric functions and representation theory. Some applications to Chern-Simons theory will also be discussed.

- `Finding a nice supercharacter theory for the Sylow p-subgroups of the symmetric group`

  `Speaker:` Tânia Silva (FCUL)

  `Abstract:` After a brief introduction to the history of supercharacters, we start with cyclic groups and several procedures will be explored as direct, semidirect and wreath product in order to study the supercharacter theory arising from the orbit method on algebra groups, aiming to find a pleasant combinatorial model for that. Some examples will be discussed in full detail.

- `Classifying and counting N=2 black holes`

  `Speaker:` Davide Polini (IST)

  `Abstract:`

  We discuss BPS black holes in an N=2 supergravity model. We use the exact symmetries of the model to classify BPS orbits, and we propose a microstate counting formula, based on modular forms, that reproduces the entropy of dyonic black holes in this model.

- `A Supercharacter Theory for approximately finite algebra groups`
  `Speaker:` Jocelyn Lochon (FCUL)

  `Abstract:` By an algebra group over a field $\mathbb{K}$ it is meant a group of the form $G = 1 + A$, where A is a nil algebra over $\mathbb{K}$ and product rule given as $(1 + a)(1 + b) = 1 + a + b + ab$; the group $G = 1 + A$ is said to be an approximately finite algebra group if there is a family $\{G_n\}_{n\in\mathbb{N}}$ of finite algebra subgroups for which G is the direct limit $\lim_{\rightarrow} G_n$.

  Assuming mild conditions on a topological group, there is a well defined notion of characters that extend the usual Character Theory of finite, or more generally compact groups; in this setting indecomposable characters play the role of irreducible characters as they fully determine the Character Theory and serve as minimal group invariants. However, the set of indecomposable characters may be too large or even too complicated to characterize, for this reason it is of interest to consider a smaller family of characters that mimics the behaviour of indecomposable ones.

  In this talk we generalize the definition of a Supercharacter Theory for finite groups into the topological group scenario, and using essentially ergodic theoretical tools we define and characterize a Supercharacter Theory for an arbitrary approximately finite algebra group.