

# Algebra Evening

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**Tuesday, 18 December 2018, Room M2**

17.30 - 18.15: **William Crawley-Boevey** (University of Bielefeld)

## **My Struggle with the Deligne Simpson Problem**

The Deligne Simpson problem (DSP) arises in the classification of linear ODEs in the complex domain, but it is elementary to state: given  $k$  conjugacy classes in  $GL(n, \mathbb{C})$ , determine whether or not there are matrices in these classes with no common invariant subspace and product equal to the identity. Work I did on quiver algebras led to a conjectural answer for the DSP, I proved one direction in 2006 with P. Shaw, and although I announced a proof of the other direction, it never got written up. In this talk I will explain the background to the DSP and discuss recent work with A. Hubery aimed at completing the other direction.

18.30 - 19.00: **Kostas Karagiannis** (Aristotle University of Thessaloniki)

## **On the canonical embedding of the Kummer-Artin-Schreier-Witt family of curves**

Arithmetic Geometry, the discipline that bridges Algebraic Geometry and Number Theory, mainly studies algebraic curves over fields of prime characteristic  $p > 0$ . Technical difficulties led Serre, Tate and Grothendieck to develop lifting techniques to fields of characteristic 0, over which curves are better understood. Applying these techniques, Oort-Sekiguchi-Suwa (1989) and Bertin-Mézard (2000), unified Artin-Schreier theory and Kummer theory, by introducing an appropriate family of curves over the ring of Witt vectors. Using results of Karanikolopoulos-Kontogeorgis (2014) on the sheaf of holomorphic differentials  $\Omega$ , we study the family's induced canonical embedding into projective space. In particular, in joint work with professors Charalambous and Kontogeorgis, we give explicit generators for the embedding's defining ideal, combining lifting techniques with elements of combinatorial commutative algebra and the theory of Gröbner bases.

19.00 - 19.30: **Ioannis Zachos** (Michigan State University)

## **Introduction to Local Models**

In this talk we will try to define the local models and give a small sketch of the historical development of the theory. The importance of the local models lies in the fact that under some assumptions they model the singularities that arise in the reduction modulo  $p$  of Shimura varieties. The Shimura varieties are often moduli spaces of abelian varieties with additional structure. Understanding the structure of local models will help us to have a better understanding of the moduli spaces of the abelian varieties with some additional structure. In this talk we will try to give most of the background needed in order to understand the above mathematical objects. Time permitted, we will state some open problems.

19.45 - 20.15: **Alexandros Grosdos** (University of Osnabrück)

## **Moment Ideals of Mixture Distributions**

Moments are quantities that measure the shape of statistical or stochastic objects and have recently been studied from an algebraic and combinatorial point of view. We start this talk by introducing (local) mixture distributions and their moment ideals. We explain how mixing distributions on the statistical side corresponds to taking secants of the algebraic varieties on the geometric one and we compute generators for the ideals involved. Furthermore, we apply elimination theory and Prony's method in order to do parameter estimation, and showcase our results with an application in signal processing. A main goal of this talk is to highlight the natural connections between algebraic statistics, geometry, combinatorics and applications in analysis throughout the talk.