

**Seminar of Representation Theory and Related Areas
Third Workshop – 9 November 2013
University of Porto**

Programme

Room FC1-003
FCUP – Maths Dept., Rua do Campo Alegre 687, Porto

11:00-11:55 Stéphane Launois (Univ of Kent, Canterbury, UK)

Efficient recognition of totally nonnegative cells

ABSTRACT: A matrix is totally positive if all of its minors are positive, and totally nonnegative if all of its minors are nonnegative. The space of $m \times p$ totally nonnegative matrices admits a cell decomposition whose big cell is the space of $m \times p$ totally positive matrices. Efficient criteria to test for total positivity are well known. In this talk, I will explain how one can use tools developed to study prime ideals in quantum matrices in order to obtain efficient criteria for all totally nonnegative cells.

12:00-12:45 Ivan Yudin (CMUC, Univ Coimbra)

Homological properties of quantized Schur algebras

ABSTRACT: The quantized Schur algebras are deformations of the classical Schur algebras. Their representation theory is connected with the representation theory of the Hecke algebras in the same way as the representation theory of the Schur algebras is related to the representation theory of the symmetric groups.

In this talk I will focus on the interplay between the categories of modules over quantized Borel-Schur and quantized Schur algebras. In particular, I will explain how projective resolutions of simple modules over quantized Borel-Schur algebras can be used to construct projective resolutions of Weyl modules over Schur algebras.

As a byproduct, we obtain the exactness of the complexes recently constructed by Boltje and Maisch, giving resolutions of the co-Specht modules for Hecke algebras.

This is a joint work with S.Donkin and A.P.Santana.

12:50-14:30 Lunch

14:30-15:15 Matthew Towers (Univ of Kent, Canterbury, UK)

Poisson and Hochschild cohomology and the semiclassical limit

ABSTRACT: Let A be a $k(q)$ -algebra with PBW basis of polynomial type admitting a semiclassical limit. I will show how to consider the ordinary enveloping algebra A^e of A as a deformation of the Poisson enveloping algebra of its semiclassical limit and use this to investigate the relationship between Hochschild cohomology and Poisson cohomology in this setting. The talk will be based on my preprint <http://arxiv.org/abs/1304.6003>.

15:20-16:05 Raquel Coelho Simões (CELC, Lisbon)

Hom-configurations and noncrossing partitions

ABSTRACT: Let Q be a Dynkin quiver and $C(Q)$ the orbit category of the corresponding bounded derived category with respect to the autoequivalence $\tau\Sigma^2$, where τ is the AR-translate and Σ is the shift functor.

In this talk we study the behaviour of maximal Hom-free sets, i.e. Hom-configurations, in $C(Q)$, which turns out to be reminiscent of that of cluster-tilting objects in the cluster category. The main result is the classification of Hom-configurations in terms of noncrossing partitions of the Weyl group associated to Q .

This work is inspired by the work of Riedtmann on the classification of self-injective algebras of finite representation type, where Hom-configurations play a key role.

16:10-16:40 Serkan Karaçuha (CMUP, Porto)

Integral calculus on quantum exterior algebras

ABSTRACT: Hom-connections and associated integral forms have been introduced and studied (by T.Brzezinski) as an adjoint version of the usual notion of a connection in non-commutative geometry. Given a flat hom-connection on a differential calculus (DC) over an algebra A yields the integral complex which for various algebras has been shown to be isomorphic to the de Rham complex. The question when the integral and the de Rham complexes are isomorphic for an algebra A with a flat hom-connection is clarified: The case where an n -dimensional DC can be constructed on a quantum exterior algebra over an A -bimodule is specialised, and criteria are given for free bimodules with diagonal or upper triangular bimodule structure. The results are illustrated for a DC on a multivariate quantum polynomial algebra and for a DC on Manin's quantum n -space.

16:40-17:10 Coffeebreak

17:10-17:55 Christian Lomp (CMUP, Univ Porto)

On an open problem of M.Cohen concerning smash products

ABSTRACT: In 1985 Miriam Cohen raised the question whether the smash product $A\#H$ of a semisimple Hopf algebra H acting on a semiprime algebra A is itself a semiprime ring. This question is open until now. In my talk I give a survey on known results concerning Cohen's question.

18:00-18:30 Christopher Young (CMUP, Porto)

Hopf subalgebras with algebraic quotient modules

ABSTRACT: Given a finite-dimensional Hopf algebra H , an H -module coalgebra or an H -module algebra has a depth depending on the point of stabilization when its tensor powers are similar as modules in the finite tensor category $H\text{-mod}$. The depth of a Hopf subalgebra is related rather precisely to the depth of its generalized quotient module coalgebra. As a consequence a Hopf subalgebra pair has finite depth if and only if their quotient module satisfies a polynomial equation with integer coefficients in the Green ring of either Hopf algebra. For example, permutation modules of group algebras are algebraic modules in this sense. Depth of any subring is defined and we also mention some examples from Noetherian rings.

This is joint work with Alberto Hernandez and Lars Kadison.