Programme Conference GNAC

CIRM, Sept 30-Oct 04, 2013

Timetable:

	Monday	Tuesday	Wednesday	Thursday	Friday
9:00	**Littelmann**	**Amiot**	**Yakimova**	**Bouarroudj**	**Marsh**
10:00	**Nazarov**	**Leclerc**	**Blondel**	**Elduque**	**de Visscher**
11:00	Coffee	Coffee	Coffee	Coffee	Coffee
11:25	**Guilhot**	**Pouchin**	**Abdellatif**	**Kashuba**	**Benkart**
12:30	Lunch	Lunch	Lunch	Lunch	Lunch
16:30	**Gille**	**Kessar**	*free*	**Conway**	*departure*
17:30	**Oggier**	**Malle**	*free*		
19:30	Dinner	Dinner	Dinner	Bouillabaisse	

Special Events:

Mon. 6:30pm: Welcoming Apéritif
Tue. 7:00pm: GDR meeting
Wed. 5:00pm: Soccer game!
Thu. 8:45pm : Olympique Lyonnais vs Vitoria Guimaraes
Thu. 9:30pm: Pétanque tournament

Ramla Abdellatif - Inner structure of mod p representations of $SL(2, \mathbb{Q}_p)$

Let p be an odd prime number and let F be a finite unramified extension of $\mathbb{Q}_p$. The important works of Breuil-Paškūnas and Hu on mod p representations of the p-adic group $GL(2, F)$ show how crucial it is to have a complete control on their inner structure, i.e. on the extensions between irreducible representations of some hyperspecial maximal open compact subgroup of $GL(2, F)$ that appear as subquotients of the considered representation. The necessity of such a control is motivated both by global and local reasons (as generalizations of Serre type conjecture or classification of p-modular representations of p-adic groups) and seems to keep playing a central role when one gets interested in more general reductive p-adic groups.
In this talk, I will focus on the case of the p-adic special linear group $SL(2, \mathbb{Q}_p)$. After recalling some basic facts and useful results about mod p representations of this group, I will explain how to get an explicit description of the inner structure aforementionned for any irreducible smooth representation of $SL(2, \mathbb{Q}_p)$ over $\overline{\mathbb{F}}_p$ and give some explicit examples. This is a joint work with Stefano Morra (Université Montpellier 2).

Claire Amiot - Preprojective algebras and Calabi-Yau duality.

(joint work with Iyama, Reiten and Oppermann) Preprojective algebras have been defined in the 70's by Gelfand and Ponomarev and play an important role in representation theory of quivers. They have very interesting homological properties among which Calabi-Yau duality. They have been recently generalized by Iyama. In this talk I will explain how these Calabi-Yau propeties generalize to higher preprojective algebras, and in which sense these properties characterize higher preprojective algebras.

Georgia Benkart - A Schur-Weyl View of the McKay Correspondence.

The finite subgroups G of SU_2 are in bijection with the simply-laced affine Dynkin diagrams by the celebrated McKay correspondence. This talk will focus on the McKay correspondence from the point of view of Schur-Weyl duality. The centralizer algebra $\mathsf{Z}_\mathsf{k}(\mathsf{G}) = \mathsf{End}_\mathsf{G}(\mathsf{V}^{\otimes \mathsf{k}})$ of the action of G on the kth tensor power of its 2-dimensional defining representation V has a rich combinatorics coming from the corresponding Dynkin diagram and has connections with partitions, partition algebras, and diagram walks. This is joint work with T. Halverson and part of it with J. Barnes.

Corinne Blondel - p-adic Spin groups and their supercuspidal representations.

Following NgôVan Dinh's thesis, we will describe the Spin group and some of its subgroups over a p-adic field of odd residual characteristic and explain how Shaun Stevens's construction of supercuspidal representations of classical p-adic groups can be adapted to the Spin group. We will next address the question of whether this construction can possibly be exhaustive.

Sofiane Bouarroudj - Deforms of Lie algebras in characteristic 2

We show that certain deformations of simple Lie algebras send some of these algebras into each other; deforms (the results of deformations) corresponding to non-trivial cohomology classes can be isomorphic to the initial algebra. This phenomenon takes place over fields of ANY CHARACTERISTIC. An implicit Grishkov's claim "The Jurman algebra is isomorphic to the derived of the alternate version of the Hamiltonian Lie algebra" is explicitly described providing an example of a "semi-trivial" deform.

John Conway - TBA.

Alberto Elduque - Fine gradings and gradings by root systems on simple Lie algebras.

The fine gradings by abelian groups on the simple finite dimensional Lie algebras over an algebraically closed field of characteristic zero will be shown to be closely related to the gradings by (not necessarily reduced) root systems, and certain gradings on the coordinate algebras.

Philippe Gille - Familles d'algèbres de quaternions et d'octonions.

Pour un anneau R (commutatif, unitaire), on sait définir la notion de R-algèbre de quaternions (resp. d'octonions). Une R-algèbre de quaternions Q donne lieu une R-forme quadratique multiplicative, la forme norme, et celle-ci détermine Q (Witt dans le cas des corps, Ojanguren-Parimala-Sridharan pour R). Le but de l'exposé est de discuter le problème analogue pour les R-algèbres d'octonions.

Jérémie Guilhot - Cellularity of the lowest two-sided ideal of an affine Hecke algebra.

This talk is concerned with affine Weyl groups and their associated affine Hecke algebras. A special feature of affine Weyl groups is that there is a distinguished Kazhdan-Lusztig cell, the so-called lowest two-sided cell, which contains, roughly speaking, most of the elements of the group. Attached to this cell is the lowest two-sided ideal of the Hecke algebra which comes naturally equipped with the Kazhdan-Lusztig basis. The aim of this talk is to show that this ideal is affine cellular. Throughout the talk, we will focus on type affine A_2. In this case, we will explicitely describe the cellular basis and show that the basis elements have a nice decomposition when expressed in the Kazhdan-Lusztig basis. More precisely, we will provide a combinatorial description of this decomposition in term of number of paths.

Iryna Kashuba - Unital representations of Jordan algebras.

The talk is devoted to the problem of the classication of unital Jordan bimodules over finite dimensional Jordan algebras. We study the indecomposable representations of Jordan using Tits-Kantor-Koecher construction and the representation theory of corresponding Lie algebras. This a joint work with V. Serganova.

Radha Kessar - On local symmetric algebras and blocks of finite groups.

The group algebra of a finite group over a field of positive characteristic is not, in general, semi-simple and the structure of its indecomposable factors (blocks) can be very complicated. In my talk, I will discuss what is known in the special case of blocks which have only one simple module.

Bernard Leclerc - Cluster algebras and q-characters of Kirillov-Reshetikhin modules.

We describe a cluster algebra algorithm for calculating q-characters of Kirillov-Reshetikhin modules for any untwisted quantum affine algebra $U_q(\hat{\mathfrak{g}})$. This yields a geometric q-character formula for tensor products of Kirillov-Reshetikhin modules. When $\mathfrak{g}$ is of type A, D, E, this formula extends Nakajima's formula for q-characters of standard modules in terms of homology of graded quiver varieties. This is a joint work with David Hernandez.

Peter Littelmann - Knuth relations, tableaux and MV-cycles

We give a geometric interpretation of the Knuth equivalence relations in terms of the affine Graßmann variety. The Young tableaux are seen as sequences of coweights, called galleries. We show that to any gallery corresponds a Mirković-Vilonen cycle and that two galleries are equivalent if, and only if, their associated MV cycles are equal.

Gunter Malle - The proof of Ore's conjecture.

Ore's conjecture asserts that in a non-abelian finite simple group, every element is a commutator. The proof of this statement was recently completed by Liebeck, O'Brien, Shalev and Tiep. We report on the various ingredients used in that proof, reaching from Deligne-Lusztig character theory to explicit computations. We also mention several related, still open problems.

Robert Marsh - Dimer models with boundary and cluster categories associated to Grassmannians

Joint work with K. Baur (Graz) and A. King (Bath).

A dimer model can be defined as a quiver embedded into a surface in such a way that the complement is a disjoint union of disks with oriented boundaries. Such models can also be considered in the case of a surface with boundary. The Postnikov diagrams used by J. Scott to describe the cluster structure of the homogeneous coordinate ring of the Grassmannian give rise to dimer models on a disk in this sense.

We associate a natural algebra to such a dimer model. This algebra is a modified version of the corresponding Jacobian algebra, taking the boundary into account. Taking the sum of the idempotents corresponding to boundary vertices, we obtain an idempotent subalgebra, which we call the boundary algebra. We show that it is independent of the choice of dimer model and coincides with an algebra that B. Jensen, A. King and X. Su have used to model the cluster structure of the homogeneous coordinate ring of the Grassmannian categorically.

Maxim Nazarov - Quantum integrability of the Calogero-Sutherland model.

This is a joint work with Evgeny Sklyanin. We consider a family of pairwise commuting operators such that the Jack symmetric functions of infinitely many variables $x_1, x_2, ...$ are their eigenfunctions. These operators are defined as limits at $N \to \infty$ of renormalised Sekiguchi-Debiard operators acting on symmetric polynomials in the variables $x_1, ..., x_N$. They are differential operators in terms of the power sum variables $p_n = x_1^n + x_2^n + ...$ and we compute their symbols by using the Jack reproducing kernel.

Our result yields a hierarchy of commuting Hamiltonians for the quantum Calogero-Sutherland model with infinite number of bosonic particles in terms of the collective variables of the model. Our result also yields explicit shift operators for the Jack symmetric functions. This amounts to the quantum integrability of the model. Equivalently, this results provides an explicit description of the stable positive spherical part of the trigonometric Cherednik algebra. We generalize these results from the Jack to the Macdonald symmetric functions.

Frédérique Oggier - Applications of (Non)associative Algebras to Space-Time Coding.

The theory of central simple algebras has over the past 10 years found surprising applications to space-time coding, an area of coding theory which deals with wireless communications. This talk will contain three parts: (1) we will briefly explain what is space-time coding, and where it comes from, (2) we will summarize some of the main techniques coming from central simple algebras to design space-time codes, and (3) we will conclude by discussing some of the recent works aiming at generalizing the design of space-time codes by using nonassociative algebras.

Guillaume Pouchin - Loop Kac-Moody algebras and loop crystals.

In this talk we will first recall the geometric construction, due to Kashiwara and Saito, of the crystal associated to a Kac-Moody algebra using the geometry of quiver representations. Then we will introduce a new combinatorial object, called a loop crystal, which will be an analog for the loop Kac-Moody algebra. This construction comes from the geometry of the space of Higgs bundles on a curve.

Maud de Visscher - Representations of the partition algebra.

The partition algebra was introduced by P. Martin. Over the complex numbers, it satisfies a double centraliser property with the symmetric group via an action on tensor space. In the first part of this talk I will review its representation theory over the complex numbers and investigate some consequences for the symmetric group (joint work with C. Bowman and R. Orellana). In the second part of the talk I will present some recent results on the representation theory of the partition algebra in positive characteristic (joint work with C. Bowman and O. King).

Oksana Yakimova - Symmetric invariants of parabolic contractions

Let $\mathfrak{g}$ be a simple Lie algebra and $\mathfrak{p}$ a parabolic subalgebra of $\mathfrak{g}$. The parabolic contraction of $\mathfrak{g}$ is the semi-direct product $\mathfrak{q} = \mathfrak{p} \ltimes (\mathfrak{g}/\mathfrak{p})$, where $\mathfrak{g}/\mathfrak{p}$ is an abelian ideal. This is a particular case of the Inönü-Wigner contraction. We will discuss a surprising connection between the algebra $\mathcal{S}(\mathfrak{q})^{\mathfrak{q}}$ of symmetric invariants of $\mathfrak{q}$ and symmetric invariants of centralisers $\mathfrak{g}_e \subset \mathfrak{g}$, where $e \in \mathfrak{g}$ is a Richardson element with polarisation $\mathfrak{p}$. Whenever $\mathcal{S}(\mathfrak{g}_e)^{\mathfrak{g}_e}$ is freely generated by the certain polynomials ${}^eF_1, \dots, {}^eF_l$ related to a set $\{F_1, \dots F_l\}$ of generating symmetric invariants of $\mathfrak{g}$ and the Slodowy slice at e, we can show that the symmetric invariants of $\mathfrak{q}$ are generated by the "contractions" of the F_i's. For example, this construction always works in types A and C.
This is a joint work with D. Panyushev.