Themes in the interface of representation theory and physics Talks/Abstracts

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Chris Hull (Imperial)
"Duality and geometry in string theory"
Abstract
see CMH: hep-th 0406102, 0604178, 0605149
CMH and A Dabholkar: 0210209, 0512005
CMH and R Reid-Edwards: 0503114, 0603094

Jean Michel Maillet (Lyon)
"Correlation functions of the XXZ spin chain : Bethe ansatz approach"
Abstract
We make a small review of the method + more recent results.

Rinat Kedem (Urbana)
"Fusion products and fermionic sum formulas"
Abstract
I will explain how to construct fermionic-type formulas for all integrable modules of affine Lie algebras which appear in the WZW model. In this construction, the Feigin-Loktev fusion product appears naturally. I will comment on the reasons for the non-existence of a quasi-particle spectrum for certain types of modules.

Robert Marsh (Leeds)
"Temperley-Lieb algebras and Catalan combinatorics"
Abstract
(Joint work with Paul P Martin.)
    The Bratelli diagram of a tower $(\mathcal{A}_n)$ of algebras encodes the composition factors of the restriction of a simple module over $\mathcal{A}_n$ to $\mathcal{A}_{n-1}$. If $\mathcal{A}_0$ is 1-dimensional, walks on the diagram correspond to basis elements of these

modules. In certain well-behaved cases, such walks can be modelled via an underlying graph (the 'Rollet' graph).

Motivated by the Temperley-Lieb diagram algebra and other examples, we define a set of axioms for a tower of algebras together with collections of modules which guarantee the existence of a Rollet graph. We give some interesting examples of towers satisfying these axioms, including the partition algebra, Brauer algebra and contour algebras.

We also show that this extra structure underlies a variety of interesting sequences of combinatorial sets. In particular, the clusters of the Fomin-Zelevinsky cluster algebras of type A_n, $n = 1, 2, ...$ form such a sequence.

Benjamin Doyon (Oxford)
"Calogero-Sutherland eigenfunctions with mixed boundary conditions and conformal field theory correlators"

Steen Ryom-Hansen (Talca)
"Bernstein-Szegö Polynomials asociated with root systems"

Abstract

This is work in collaboration with J. F. van Diejen and A. C. de la Maza.

We introduce multivariate generalizations of the Bernstein-Szegö polynomials associated with root systems. The polynomials in question generalize Macdonald's Hall-Littlewood polynomials associated with root systems. In type **A1** we recover the original Bernstein-Szegö polynomials.

Our main results are an orthogonality property between the polynomials and an exact formula for them, both valid for the weights sufficiently deep in the dominant cone.

Philipe DiFrancesco (Saclay)
"Integrable loop models, alternating sign matrices, plane partitions and orbital varieties: proofs and conjectures "

Stephen Doty (Loyola, Chicago)
" Generators & relations for generalized q-Schur algebras "

Maxim Nazarov (York)
"Twisted Yangians and Mickelsson algebras"

Konni Rietsch (Kings/Cambridge)
"A mirror symmetric solution to the quantum Toda lattice"

Takeshi Suzuki (Kyoto)
" Cherednik Algebras in Conformal Field Theory "

Alison Parker (Leicester)
"The symplectic blob algebra"

Nenad Manojlovic (Algarve)
"Creation operators and Bethe vectors for the $E_{\tau,\eta}(so_3)$ elliptic quantum group"

Abstract

Algebraic Bethe ansatz is implemented for the $E_{\tau,\eta}(so_3)$ elliptic quantum group. The corresponding elliptic quantum dynamical R-matrix is, in some sense, similar to the Izergin-Korepin R-matrix, so that the underling algebraic structure turns out to be analogous to the operator algebra in Tarasov's approach to the Izergin-Korepin system. Namely, creation operators are not simple functions of one of the Lax matrix entries, but they are complicated polynomials of three generators of the elliptic quantum group given by a recurrence relation. Moreover, they have the desired symmetry properties. The action of the creation operators on the highest weight vector yields the

Bethe states. Thus the action of the transform matrix on the Bethe vectors can be computed and the unwanted terms vanish once the Bethe equations are imposed.

Vladimir Rittenberg (Bonn)
"Associative algebras and stochastic processes "

Iain Gordon (Edinburgh)
" Quiver varieties and q-Schur algebras "

Christian Korff (Glasgow)
" Q operator and loop algebra symmetry of the six-vertex quantum transfer matrix "

Abstract

The quantum transfer matrix is a technical tool to describe the finite temperature regime of the XXZ quantum spin-chain. For instance, its trace gives the partition function of the XXZ model. This integrable model is closely related to the q-deformed enveloping algebra of affine sl_2 and I will present how the representation theory of the latter can be harnessed to derive functional equations describing the spectrum of the transfer matrix and to explain degeneracies in it at roots of unity.

Niall MacKay (York)
" Rational YBE for exceptional algebras "
Abstract

see math.QA/0608248

Pavel Pyatov (Dubna)
" Experimental algebra and combinatorics for XXZ spin chains and for Raise and Peel Models "

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Richard Green (Colorado)
" Applications of full heaps to representation theory and physics "

Abstract

A full heap over a Dynkin diagram consists of a locally finite poset together with a map from the poset to the vertices of the Dynkin diagram such that three conditions are satisfied. We will discuss various applications of full heaps, highlighting the connections with Weyl groups, permutation groups, Del Pezzo surfaces, representations of Lie algebras, and M-theory.

Alexei Semikhatov (Lebedev Institute, Moscow)
" Factorizable ribbon quantum groups at roots of unity: between conformal field theory and lattice models "

Boris Noyvert (York)
"Superconformal algebras of parafermionic type"

Abstract

New parafermionic algebra will be presented. The algebra is Z2 x Z2 graded and formed by three N=1 superconformal algebras coupled to each other by nontrivial commutation relations of parafermionic type. Representation theory and unitary models will be briefly discussed. The main reference is hep-th/0612045.

Hubert Saleur (Saclay)
" Associative algebraic approach to logarithmic conformal field theories "

Zoltan Bajnok (Budapest)
" Equivalences between spin models induced by defects "

Abstract

The spectrum of integrable spin chains are shown to be independent of the ordering of their spins. As an application we introduce defects (local spin inhomogeneities in homogenous chains) in two-boundary spin systems and, by changing their locations, we show the spectral equivalence of different boundary conditions. In particular we relate certain nondiagonal boundary conditions to diagonal ones.

Bruce Westbury (City/Warwick)
" Two-boundary Temperley-Lieb algebras "

Andrey Mudrov (York)
" Universal solution of reflection equation and twisted Yangians "

Tetsuji Miwa (Kyoto)
" Correlation functions for the XXZ spin chain with a disordered field "

Petr Kulish (Steklov, St Petersburg)
" Algebraic features of integrable spin chains "

Stephen Donkin (York)
"Some Remarks on the Ring of Twisted Tilting Modules"

Abstract

(joint with Sumanth Matrapu Datt)

Let G be a semisimple, simply connected algebraic group over a field of characteristic p. For each highest weight λ there is an indecomposable tilting module $T(\lambda)$ and an arbitrary tilting module is a direct sum of such $T(\lambda)$'s. Moreover a tensor product of tilting modules is again a tilting module. It follows that the classes of the tilting modules span a subring of the representation ring of G. The ring structure is rather simple; in fact this ring is the free polynomial ring on tilting modules labeled by the fundamental dominant weights. We consider here the larger ring generated by all Frobenius twists of tilting modules. However, we can say little about the ring structure in general. For $G = \mathrm{SL}(2)$, tensor products of Frobenius twists of tilting modules occur naturally in recent of Doty and Henke and in this case we give a description of the ring by generators and relations, show that the ring is reduced and describe associated varieties.

Rowena Paget (Kent)
" Stratification of Brauer algebras and other diagram algebras "

Sanjaye Ramgoolam (QMUL)
" Large N expansion of q-deformed two-dimensional Yang-Mills and Hecke algebras "

Bogdan Stefanski (Imperial)
" Spin chains, gauge theory and strings "