List of Abstracts

Workshop on Diagram Algebras

September 8-12, 2014 at the University of Stuttgart, Germany
All lectures will take place in room V57.02.

Monday

14:05 - 14:55 Gus Lehrer
Title: The second fundamental theorem of invariant theory, old new and super

Abstract: I shall explain a diagrammatic method for converting tensor invariants of the orthosymplectic supergroup into tensor invariants of the super general linear group. This is based on algebraic-geometric arguments which go back to Atiyah, and leads to precise versions of the first and second fundamental theorems for the orthosymplectic Lie superalgebra.

15:05 - 15:30 Geetha Thangavelu
Title: The alternating Schur algebra

Abstract: Let K be an algebraically closed field and let $V = K^n$. The alternating Schur algebra $AS_{n,d}(K)$ is defined by $AS_{n,d}(K) = End_{A_d}V^{\otimes d}$, where A_d denotes the alternating group. Regev and Henke have done a significant work in this direction. One of their main observation which is of interest to us is, if $n^2 < d$, then the alternating Schur algebras are nothing new which is same as the classical Schur algebras. This motivated us to study the case when $n^2 \geq d$. In this talk, I will talk about a basis, combinatorial description of structure constants and the centre of this algebra. This is joint work with Amritanshu Prasad.

16:10 - 16:35 Chris Bowman
Title: The representation theory of partition algebras

Abstract: The partition algebra first arose in statistical mechanics. It has recently proven to be a useful tool in the study of stability properties of symmetric groups; for example it has been used to deduce the block structure of Deligne's tensor category, and has had applications to the Kronecker problem. In this talk we shall discuss the duality between the symmetric group and partition algebra, applications to the Kronecker problem, and the block structure of the partition algebra in characteristic $p \geq 0$. This is based on joint work with Maud De Visscher, Rosa Orellana, and Oliver King.

16:45 - 17:10 Oliver King
Title: On the decomposition matrix of the partition algebra in positive characteristic

Abstract: We recall the geometric characterisation of the blocks of the partition algebra $P_r(\delta)$ in positive characteristic. We then show that we can use this to determine the full decomposition matrix for certain families of partition algebras; in particular when the parameter δ is not an integer, when the degree r of the partition algebra is smaller than the characteristic of the ground field, and for one further case.

Tuesday

9:00 - 9:50 John Enyang
Title: The radical of the Brauer algebra

Abstract: Let $n \in \mathbb{Z}$ and write $B_k(n)$ for the k strand Brauer algebra over a field of characteristic zero, with loop parameter n. It is known that if the magnitude of n is sufficiently large compared to k then $B_k(n)$ is semisimple and there are no non-trivial $B_k(n)$-module maps between distinct cell modules of $B_k(n)$. In this talk, we will introduce a recursive relation on pairs of Young diagrams which explicitly describes the space of homomorphisms between any pair of cell modules of a non-semisimple Brauer algebra $B_k(n)$. Using these results, we define a basis for the radical of each cell module of $B_k(n)$. The first part of our construction provides a Brauer algebra analogue to work of P. Martin for partition algebras over a field of characteristic zero.

10:00 - 10:25 Dung Tien Nguyen
Title: A cellular basis of q-Brauer algebras

Abstract: In this talk we introduce a new basis of the q-Brauer algebra, which is a lift of Murphy bases of the Hecke algebras of the symmetric groups. This basis is then shown to be cellular in the sense of Graham and Lehrer and it enables us to claim that in general there does not an algebra isomorphism between the q-Brauer algebra and the BMW-algebra.

11:05 - 11:30 Inga Benner
Title: Permutation modules for cellularly stratified diagram algebras

Abstract: We study the structure of cellularly stratified algebras A with group algebras of symmetric groups as subalgebras. We define analogues $Ae_l \underset{k\Sigma_l}{\otimes} M^\lambda$ of permutation modules and their indecomposable summands, the Young modules $Y(l,\lambda)$, following the ideas of Hartmann and Paget for Brauer algebras. As in the case of permutation modules over group algebras of symmetric groups, we see that there is an order on the indices such that a Young module appears as a summand of a permutation module only if it has larger index. We give sufficient conditions for $Ae_l \underset{k\Sigma_l}{\otimes} M^\lambda$ to have a cell filtration and for $Y(l,\lambda)$ to be the relative projective cover of the cell module $Ae_l \underset{e_lAe_l}{\otimes} S_\lambda$ with respect to the category $\mathcal{F}(\Theta)$ of cell filtered modules.

11:40 - 12:20 Ge Li
Title: A KLR Grading of the Brauer algebras

Abstract: In this talk we will talk about grading of Brauer algebras over a field of char 0, and give a graded cellular basis of the graded Brauer algebras.

15:30 - 16:20 Arjeh Cohen
Title: Brauer algebras of Dynkin type

Abstract: The Brauer algebra is the centralizer of n-fold tensors of the natural representations of the orthogonal and symplectic group. It is cellular and (generically) semisimple; it maps homomorphically onto the group algebra of the symmetric group on n letters; it contains the Temperley-Lieb algebra as a subalgebra; it is a specialization of the Birman-Wenzl-Murakami algebra and has a natural definition in terms of generators and relations.
The relations can be summarized by use of the Dynkin diagram of type A_{n-1}, whose Weyl group is the symmetric group on n letters. We address the question: to what extent are there similar algebras for other Dynkin types?
The research reported on is joint work with David Wales, Shona Yu, Dié Gijsbers, and Shoumin Liu.

17:00 - 17:40 Emuanuel Wagner
Title: Markov traces on the Birman-Murakami-Wenzl algebras

Abstract: (joint work with Ivan Marin) In order to classify all Markov traces (and hence link invariants) factoring through the Birman-Murakami-Wenzl algebra we introduce an extension of this algebra which takes simultaneously into account the symplectic and orthogonal incarnation of this algebra. On one hand, for generic enough values of the defining parameters we prove that the only possible Markov traces are the ones providing the HOMFLYPT and the Kauffman link invariant and that the extension is in fact trivial. On the other hand for a family of special parameters, we obtain new algebraic object as well as new Markov traces. This new algebraic structure allows in particular to define extension of the Temperley-Lieb algebra and of the Hecke algebra for $q = -1$.

Wednesday

9:00 - 9:50 Arun Ram
Title: Affine and degenerate affine BMW algebras

Abstract: This talk will be a survey of recent and forthcoming papers with Zajj Daugherty and Rahbar Virk. In this work the affine and degenerate affine BMW algebras are completely parallel: with parallel presentations, parallel structure and parallel representation theory. These algebras act on tensor space and are in Schur-Weyl duality with orthogonal and symplectic groups and quantum groups. The centers of these algebras are described by symmetric functions with a cancellation property as in the description of the cohomology and K-theory of symplectic and orthogonal Grassmannians. The representation theory of these algebras can be described by multisegments and the decomposition numbers are given by Kazhdan-Lusztig polynomials.

10:00 - 10:25 Armin Shalile
Title: Decomposition numbers of Brauer algebras via Jucys-Murphy elements

Abstract: In this talk, we will give a description of decomposition numbers of Brauer algebras over a field of characteristic not dividing the degree of the Brauer algebra. The description will be in terms of Jucys-Murphy elements and is motivated by the Okounkov-Vershik approach to the study of symmetric groups which proposes to view the algebra generated by Jucys-Murphy elements as a Cartan subalgebra

and study the representation theory in the spirit of Lie theory.

11:05 - 11:30 Sadek Alharbat
Title: Classification of affine fully commutative elements and affine Temperley-Lieb algebras

Abstract: I would like to present normal forms of affine fully commutative elements I have recently obtained of the affine A, B, C and D types, with some applications to the diagram "Temperley-Lieb" algebras, such as: affine Markov traces.

11:40 - 12:20 Zajj Daugherty
Title: Representation theory of the two-boundary Temperley-Lieb algebra

Abstract: Work of de Gier and Nichols explored the two-boundary Temperley-Lieb algebra, which had arisen as a generalization of the classical Temperley-Lieb algebra via work in statistical mechanics. They present the two-boundary Temperley-Lieb algebra both as a diagram algebra and as a quotient of the affine Hecke algebra of type C. In work with A. Ram, we have presented the affine Hecke algebra of type C as a centralizer algebra and as a quotient of the two-poled braid group. This work provides new tools for studying the two boundary Temperley-Lieb algebra, yielding beautiful combinatorial representation theoretic results.

15:00 - 15:50 Antonio Sartori
Title: A web diagram algebra for categorifying $gl(1|1)$

Abstract: In his groundbreaking work, Khovanov defined an arc algebra which categorifies $sl(2)$-representations. Although being described diagrammatically, Khovanov's algebra is substantially different from usual diagram algebras (like Hecke algebras, Brauer algebras, KLR algebras etc.). In the talk, I will present an analogue of Khovanov's algebra for $gl(1|1)$. Similarly as in the $sl(2)$ case, the diagrams used remind of the web diagrams describing the intertwining operators and the canonical basis of $gl(1|1)$. In constrast to the case of usual diagram algebras, the main difficulty is to define the multiplication: this requires additional structure (a TQFT in Khovanov's case, and some commutative algebra in the $gl(1|1)$ case). This algebra is cellular and properly stratified, and has interesting connections with the BGG category O, Soergel bimodules and the cohomology ring of the Springer fiber.

16:30 - 17:20 Hans Wenzl
Title: Centralizer algebras for spinor representations

Abstract: We give an algebraic description of the centralizer algebras for the n-th tensor power of a spinor representation of an orthogonal quantum groups. In the even-dimensional case, this is given by a representation of a non-standard q-deformation $U_q' so_n$ of the universal enveloping algebra of the orthogonal Lie algebra so_n. In the odd-dimensional case, a similar description can be given, using a subalgebra of $U_q' so_n$.

Thursday

9:30 - 10:20 Anne-Laure Thiel
Title: Diagrammatic categorification

Abstract: In this talk, the aim is to present categorification and in particular its diagrammatic approach, which has the benefit of working with more handable categories but also provides descriptions by generators and relations of abstract categories. We will illustrate this in details by describing both the category of extended affine Soergel bimodules and its Elias-Khovanov-Williamson-like diagrammatic counterpart, which categorify the extended Hecke algebra of affine type A. If time permits, we will treat the case of the affine Schur algebra. Joint work with Marco Mackaay.

11:05 - 11:30 Joanna Meinel
Title: The center of the affine nilTemperley-Lieb algebra

Abstract: We describe the center of the affine nilTemperley-Lieb algebra by studying its faithful representation on particle configurations on a circle. In the process we encounter a monomial basis of the affine nilTemperley-Lieb algebra.

11:40 - 12:20 James East
Title: Idempotent generation in partition monoids

Abstract: The partition algebras are twisted semigroup algebras of the partition monoids. The original motivation for thinking about partition algebras in this way was to harness the techniques of semigroup theory in order to establish the cellularity of the algebras (Wilcox, 2007) - further applications include presentations by generators and relations (East, 2011), and a classification of idempotent basis elements (Dolinka, et al, 2014).
In this talk, I will report on separate projects with Des FitzGerald (University of Tasmania) and Bob Gray (University of East Anglia) on the semigroup generated by the idempotents of a partition monoid. As well as being able to completely describe the idempotent-generated subsemigroup, we also obtain combinatorial results such as a classification and enumeration of the minimal (idempotent) generating sets for the singular ideal, a calculation of the minimal number of (idempotent) partitions required to generate an arbitrary ideal, and we also give the corresponding results for the Brauer and Jones (aka Temperley- Lieb) monoids. A separate approach is required for the finite and infinite cases, and each case has its own combinatorial charm.

15:30 - 16:20 Frederick Goodman
Title: Cellular bases of algebras with a Jones basic construction

Abstract: I will discuss certain cellular bases of algebras which are generically obtained by repeated Jones basic constructions. Examples include the Brauer and BMW algebras, partition algebras and Temperley Lieb algebras. The bases obtained are analogues of the Murphy basis of the Hecke algebra of the symmetric group. This is joint work with John Enyang.

17:00 -17:40 Azat Gainutdinov
Title: Affine Temperley-Lieb algebra at roots of unity and logarithmic conformal field theory

Abstract: I will present a connection between representation theory of affine TL algebras at roots of unity cases and the Virasoro algebra.

Friday

9:00 - 9:50 Steen Ryom-Hansen
Title: Gradings on the Temperley-Lieb and the blob-algebra

Abstract: In the talk we will present the results of joint work with David Plaza. We show that the Temperley-Lieb algebra and the blob-algebra can be endowed with non-trivial $\mathbb{Z}$-gradings, making them graded cellular algebras. These gradings come from the corresponding (cyclotomic) Hecke algebras, that have been shown by Brundan-Kleshchev and Rouquier to be isomorphic to cyclotomic KLR-algebras that are naturally $\mathbb{Z}$-graded. The most difficult part of our work is concerned with the blob-algebra. Here we needed tricky combinatorial arguments in order to construct a theory of Jucys-Murphy operators and thus achieve our goal.

10:00 - 10:25 Friederike Stoll
Title: A cell filtration of mixed tensor space I

Abstract: We construct a cellular basis of the walled Brauer algebra which has similar properties as the Murphy basis of the group algebra of the symmetric group. In particular, the restriction of a cell module to a certain subalgebra can be easily described via this basis. Furthermore, the mixed tensor space possesses a filtration by cell modules – although not by cell modules of the walled Brauer algebra itself, but by cell modules of its image in the algebra of endomorphisms of mixed tensor space.

11:05 - 11:30 Mathias Werth
Title: A cell filtration of mixed tensor space II

Abstract: We construct a cellular basis of the walled Brauer algebra which has similar properties as the Murphy basis of the group algebra of the symmetric group. In particular, the restriction of a cell module to a certain subalgebra can be easily described via this basis. Furthermore, the mixed tensor space possesses a filtration by cell modules – although not by cell modules of the walled Brauer algebra itself, but by cell modules of its image in the algebra of endomorphisms of mixed tensor space.

11:40 - 12:30 Catharina Stroppel
Title: Quantum symmetric pairs and categorification

Abstract: The theory of Khovanov-Lauda and Rouquier describes actions of Lie algebras or quantum groups on categories. We briefly explain the tensor product categorification theorem and give an example. Then we extend this to actions of quantum symmetric pairs and explain its connection with diagrammatically defined algebras.