

Seminar & Events Bulletin: Combinatorics

01-01-2012 to 06-30-2012

Friday, January 27, 2012

4:10pm-5:00pm **Combinatorics** -- Nathan Reading (NCSU) *Universal geometric cluster algebras* -- 3866 East Hall

Friday, February 03, 2012

4:10pm-5:00pm **Combinatorics** -- Suho Oh (University of Michigan) *Triangulations of product of simplices* -- 3866 East Hall

Friday, February 10, 2012

4:10pm-5:00pm **Combinatorics** -- John Stembridge (University of Michigan) *W-Cells from Scratch* -- 3866 East Hall

Friday, February 17, 2012

4:10pm-5:00pm **Combinatorics** -- Ivan Corwin (Microsoft and MIT) *Tropical combinatorics and Whittaker functions* -- 3866 East Hall

Friday, February 24, 2012

4:10pm-5:00pm **Combinatorics** -- Jinho Baik (University of Michigan) *Maximal crossing and nesting of random matchings* -- 3866 East Hall

Friday, March 09, 2012

4:10pm-5:00pm **Combinatorics** -- Svante Linusson (KTH) *TASEP on a circle with many types of particles* -- 3866 East Hall

Friday, March 16, 2012

4:10pm-5:00pm **Combinatorics** -- Reiho Sakamoto (Tokyo University of Science) *A survey on box-ball systems* -- 3866 East Hall

Friday, March 23, 2012

4:10pm-5:00pm **Combinatorics** -- Alexander Ellis (Columbia University) *Odd symmetric functions* -- 3866 East Hall

Friday, March 30, 2012

4:10pm-5:00pm **Combinatorics** -- Patricia Hersh (NCSU) *Symmetric chain decomposition for cyclic quotients of Boolean algebras and relation to cyclic crystals* -- 3866 East Hall

Friday, April 06, 2012

4:10pm-5:00pm **Combinatorics** -- David Perkinson (Reed College) *The algebraic geometry of sandpiles* -- 3866 East Hall

Friday, April 13, 2012

4:10pm-5:00pm **Combinatorics** -- Karola Meszaros (University of Michigan) *Flow polytopes and the Kostant partition function* -- 3866 East Hall

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Abstracts

Combinatorics

Friday, January 27, 2012, 4:10pm-5:00pm

3866 East Hall

Nathan Reading (NCSU)

Universal geometric cluster algebras

For each skew-symmetrizable integer matrix B , there are infinitely many cluster algebras of geometric type, differing by a choice of coefficients. These are related by maps called coefficient specializations. In this talk, I'll discuss the general problem of finding a cluster algebra of geometric type that is universal, in the sense of coefficient specializations, among geometric cluster algebras for B . If B is of finite type, then the problem was solved by Fomin and Zelevinsky. I'll show how the Fomin-Zelevinsky result can be rephrased in a form that admits generalization beyond finite type. The generalization revolves around a fan called the mutation fan for B .

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Friday, February 03, 2012, 4:10pm-5:00pm

3866 East Hall

Suho Oh (University of Michigan)

Triangulations of product of simplices

After the work of Develin and Sturmfels on tropical convexity, Ardila and Develin defined tropical oriented matroids, and showed that they encode subdivisions of product of simplices. In a joint work with Yoo, we show that every triangulation of product of simplices encode a tropical oriented matroid. In this talk, I will give a survey on this topic, and introduce an ongoing project, on connections to matching fields studied by Bernstein and Zelevinsky.

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Friday, February 10, 2012, 4:10pm-5:00pm

3866 East Hall

John Stembridge (University of Michigan)

W-Cells from Scratch

A W -graph is an edge-weighted graph that encodes certain representations of a Weyl group W or its associated Hecke algebra. Hecke algebra by left or right multiplication on its Kazhdan-Lusztig basis has this form. Knowing the W -graph makes the computation of Kazhdan-Lusztig polynomials relatively easy.

In particular, the action of the

In this talk we will describe a method, not yet completely effective, for constructing the (necessarily finite) set of "admissible" W -cells. This is a class of W -graphs that includes the cells (i.e., strongly connected components) of the Kazhdan-Lusztig W -graph. For example, in type A up to rank 9, we know that the only admissible cells are the K - L cells, but this fails for general W .

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Friday, February 17, 2012, 4:10pm-5:00pm

3866 East Hall

Ivan Corwin (Microsoft and MIT)

Tropical combinatorics and Whittaker functions

The Robinson-Schensted-Knuth (RSK) correspondence is a combinatorial mapping which plays a fundamental role in the theory of Young tableaux, symmetric functions, ultra-discrete integrable systems and representation theory. It is also the basic structure that lies behind the 'solvability' of a particular family of combinatorial models in probability and statistical physics which include longest increasing subsequence problems, directed last passage percolation in 1+1 dimensions, the totally asymmetric exclusion process, queues in series and discrete models for surface growth. There is a geometric version of the RSK correspondence introduced by A.N. Kirillov, known as the 'tropical RSK correspondence'. We show that, with a particular family of product measures on its domain, the tropical RSK correspondence is closely related to $GL(N, \mathbb{R})$ -Whittaker functions and yields analogues in this setting of the Schur measures and Schur processes on integer partitions.

This is based on joint work with Neil O'Connell, Timo Seppalainen and Nikos Zygouras.

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Friday, February 24, 2012, 4:10pm-5:00pm

3866 East Hall

Jinho Baik (University of Michigan)

Maximal crossing and nesting of random matchings

The number of complete matchings on $[2n]$ with no crossings equals the Catalan number and so does the number of matchings with no nestings. The notion of r -crossing (r -nesting) matchings is a generalization of matchings with no crossings (nestings). The number of matchings with no j -crossing and no k -nesting was evaluated by Chen, Deng, Du, Stanley and Yan in 2007 in terms of a Toeplitz determinant. This work was based on a bijection between partitions and vacillating tableaux. Building on their work, we study the limiting joint distribution of the maximal crossing and the maximal nesting of random Poissonized matchings. This is a joint work with Robert Jenkins (UM).

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Combinatorics**Friday, March 09, 2012, 4:10pm-5:00pm****3866 East Hall****Svante Linusson (KTH)***TASEP on a circle with many types of particles*

Consider words of length $N > n$ with letters from the alphabet $\{1, \dots, n\}$. We study the Markov chain where a letter i can jump to the left if the letter to its left is larger. This is called a multi-type TASEP and if all jump rates are equal, Ferrari and Martin have designed a model which gives a nice combinatorial description of the stationary measure. I will describe this model and discuss the problem when the different letters (particles) have different jump rates. Our work leads to progress on a recent positivity conjecture by Lam and Williams stemming originally from work by Lam on reduced infinite words in Affine Coxeter groups.

This is joint work with Arvind Ayyer.

Combinatorics**Friday, March 16, 2012, 4:10pm-5:00pm****3866 East Hall****Reiho Sakamoto (Tokyo University of Science)***A survey on box-ball systems*

The box-ball systems are the typical example of ultradiscrete (or tropical) integrable systems. In this talk, I will give a brief survey of recent developments in the subject. The topics will include early history, definition based on the crystal bases of quantum affine algebras, the relation with the rigged configurations, several mathematical applications and a recently found variation called the box-basket-ball system.

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Friday, March 23, 2012, 4:10pm-5:00pm

3866 East Hall

Alexander Ellis (Columbia University)

Odd symmetric functions

We introduce the odd symmetric functions, a \mathbb{Z} -graded Hopf superalgebra which exhibits signed analogues of many of the combinatorial properties of the classical symmetric functions: elementary and complete bases, Kostka numbers, Schur functions, RSK and Littlewood-Richardson, and so forth. This superalgebra is obtained as a quotient of a q -Hopf algebra isomorphic to the graded dual of the quantum quasi-symmetric functions. It also arises as the kernel of odd divided difference operators which act on skew polynomials; these operators are part of an odd nilHecke algebra. Odd nilHecke algebras can be used to categorify half of quantum $\mathfrak{sl}(2)$ and, conjecturally, give a 2-representation theoretic construction of odd Khovanov homology.

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Friday, March 30, 2012, 4:10pm-5:00pm

3866 East Hall

Patricia Hersh (NCSU)

Symmetric chain decomposition for cyclic quotients of Boolean algebras and relation to cyclic crystals

The quotient of a Boolean algebra by a cyclic group is proven to have a symmetric chain decomposition. This generalizes earlier work of Griggs, Killian and Savage on the case of prime order, giving an explicit construction for any order, prime or composite. The combinatorial map specifying how to proceed downward in a symmetric chain is shown to be a natural cyclic analogue of Kashiwara's \mathfrak{sl}_2 lowering operator in the theory of crystal bases. The talk will include a survey of related past work on symmetric chain decomposition and unimodality by Greene-Kleitman, Griggs-Killian-Savage, Proctor, Stanley and others as well as a discussion of open questions that still remain. This is joint work with Anne Schilling.

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Friday, April 06, 2012, 4:10pm-5:00pm

3866 East Hall

David Perkinson (Reed College)

The algebraic geometry of sandpiles

The Abelian Sandpile Model (ASM) is a game played on a graph realizing the dynamics implicit in the discrete Laplacian matrix of the graph. This introductory talk will apply the theory of lattice ideals from algebraic geometry to the Laplacian matrix, drawing out connections with the ASM.

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Friday, April 13, 2012, 4:10pm-5:00pm

3866 East Hall

Karola Meszaros (University of Michigan)

Flow polytopes and the Kostant partition function

This talk will survey the remarkable connections between flow polytopes and Kostant partition functions. One intriguing result in this field is a theorem of Stanley and Postnikov, which expresses the volume of a flow polytope as a Kostant partition function. I'll present a generalization of this theorem, as well as constructions of flow polytopes with combinatorial volumes. The talk is based on joint work with Alejandro H. Morales.