

Seminar & Events Bulletin: Student Combinatorics Seminar

01-01-2013 to 06-30-2013

Monday, January 14, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- () *Planning and Cookies!* -- 3088 East Hall

Monday, January 28, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Yi Su (UM) *Electrical Networks, Electrical Lie Group and Lie Algebra* -- 3088 East Hall

Monday, February 04, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Alex Leaf (UM) *The Seymour-Robertson Theorem and Graph Minor Theory* -- 3088 East Hall

Monday, February 11, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Charlotte Chan (UM) *Chevalley's Theorems: Representations of Lie Groups and Invariants of Finite Groups* -- 3088 East Hall

Monday, February 18, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Robert Walker (UM) *An Evening with Lagrange Inversion and Interpolation* -- 3088 East Hall

Monday, February 25, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Michael Chmutov (UM) *Combinatorial Hopf Algebras* -- 3088 East Hall

Monday, March 11, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Kevin Carde (UM) *Distributive Lattices* -- 3088 East Hall

Monday, March 18, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Chris Fraser (UM) *Statistical Mechanics and Enumerative Combinatorics* -- 3088 East Hall

Monday, April 01, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Rachel Karpman (UM) *Puzzles and (equivariant) cohomology of Grassmannians* -- 3088 East Hall

Monday, April 08, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- Elena Yudovina (UM) *A character-building way of computing chromatic polynomials* -- 3088 East Hall

Monday, April 15, 2013

4:00pm-5:00pm **Student Combinatorics Seminar** -- David Benson-Putnins (UM) *Quantum Groups - why are they quantum, and what makes them groups?* -- 3088 East Hall

Seminar & Events Bulletin: Student Combinatorics Seminar
01-01-2013 to 06-30-2013

Abstracts

Student Combinatorics Seminar
Monday, January 14, 2013, 4:00pm-5:00pm
3088 East Hall
()
Planning and Cookies!

Come eat cookies and discuss the topics for this semester's Student Combinatorics Seminar!

Student Combinatorics Seminar
Monday, January 28, 2013, 4:00pm-5:00pm
3088 East Hall
Yi Su (UM)

Electrical Networks, Electrical Lie Group and Lie Algebra

I will first talk about another class of Lie groups, namely electrical Lie groups introduced by Thomas Lam and Pavlo Pylyavskyy. These groups or rather their positive parts act on the planar electrical networks with boundary vertices specified. The relation in the corresponding Lie algebra is suggested by the star-triangle operation in electrical network. In type A, this group is isomorphic to $SP(2n)$. There is also a decomposition of the group analogous to the one of totally nonnegative matrices in $SL(n)$. Towards the end, I will talk about the generalization of this definition to other Lie types, and some progress in this problem.

Seminar & Events Bulletin: Student Combinatorics Seminar

01-01-2013 to 06-30-2013

Student Combinatorics Seminar
Monday, February 04, 2013, 4:00pm-5:00pm
3088 East Hall
Alex Leaf (UM)

The Seymour-Robertson Theorem and Graph Minor Theory

In the 1930s, Klaus Wagner conjectured that in any infinite set of finite undirected graphs, there exist two graphs on the list such that one graph is isomorphic to a minor of the other. Neil Robertson and Paul Seymour proved Wagner's Conjecture (now the Seymour-Robertson Theorem) over the course of twenty papers published between 1983 and 2004. While the statement of this theorem may seem inconspicuous at first, the Seymour-Robertson Theorem, and its proof, have had a huge impact on graph theory. For example, this theorem guarantees the existence of a polynomial time algorithm for testing any minor-closed property of graphs, such as embeddability on a fixed closed, compact surface. In this talk, we will discuss some of the ideas behind the proof of this theorem, and some of its consequences. We will not assume any previous background in graph theory.

Student Combinatorics Seminar
Monday, February 11, 2013, 4:00pm-5:00pm
3088 East Hall
Charlotte Chan (UM)

Chevalley's Theorems: Representations of Lie Groups and Invariants of Finite Groups

Our main goal will be to discuss two of Chevalley's major theorems, bringing together ideas from representation theory, commutative algebra, algebraic geometry, and combinatorics. The first theorem relates the ring of class functions of a Lie group to the ring of functions on a maximal torus invariant under the action of the Weyl group. As one way to try to understand the representations of a Lie group is to understand the space in which characters live, it is then natural to ask (by way of Chevalley's first theorem) what the structure of the Weyl-invariant functions on a maximal torus is. Chevalley's second theorem gives a beautiful answer to this result: it is a polynomial ring!

For commutative algebraists: Let R be the polynomial ring of n indeterminates with complex coefficients and let G be a finite subgroup of $GL_n(\mathbb{C})$. The ring of invariants R^G is a Cohen-Macaulay ring. But when is R^G a polynomial ring? Equivalently, for algebraic geometers: When is the quotient variety $\mathbb{C}^n/G = \mathbb{A}^m$? There is a clean classification to such groups. In this discussion, we will also see the appearance of the regular representation of G , tying our discussion back to representation theory.

Seminar & Events Bulletin: Student Combinatorics Seminar

01-01-2013 to 06-30-2013

Student Combinatorics Seminar

Monday, February 18, 2013, 4:00pm-5:00pm

3088 East Hall

Robert Walker (UM)

An Evening with Lagrange Inversion and Interpolation

Often enough, math talks communicate results that, while charming in a fleeting moment, will not amount to a "Chekhov's gun" in terms of being used at any stage of one's active research. By contrast, the goal of this talk is to emphasize--through both standard and nonstandard examples in combinatorics--how, and roughly when, the techniques of Lagrange Inversion and Interpolation can be used to tackle research problems.

Student Combinatorics Seminar

Monday, February 25, 2013, 4:00pm-5:00pm

3088 East Hall

Michael Chmutov (UM)

Combinatorial Hopf Algebras

The talk is an introduction to combinatorial Hopf algebras. We will review the definition of a Hopf algebra and a few basic facts, and follow with some important examples of combinatorial Hopf algebras. Finally we will look in some more detail at the algebra of symmetric functions and the place it occupies in Zelevinski's theory of positive self-dual Hopf algebras.

Student Combinatorics Seminar

Monday, March 11, 2013, 4:00pm-5:00pm

3088 East Hall

Kevin Carde (UM)

Distributive Lattices

It is remarkable that the simple definition of a partially ordered set can lead to such a rich theory. Even better, some posets have additional structure, allowing us to say even more about them. Lattices are one of the foremost examples of a class of nice posets. But even better, some lattices have additional structure, allowing us to say even more. In this talk, I'll introduce distributive lattices, the nicest of these nice posets, and I'll touch on a variety of topics, from finite topologies to Monte Carlo algorithms for generating random combinatorial objects.

Seminar & Events Bulletin: Student Combinatorics Seminar
01-01-2013 to 06-30-2013

Student Combinatorics Seminar
Monday, March 18, 2013, 4:00pm-5:00pm
3088 East Hall
Chris Fraser (UM)

Statistical Mechanics and Enumerative Combinatorics

Statistical mechanics and enumeration are fundamentally intertwined. In the first few minutes of the talk, I will allude to a number of different situations where statistical mechanical ideas have informed combinatorics/optimization, and discuss what statistical mechanics "is all about."

After that, I will consider the Ising model in detail. I will discuss the combinatorial formulation of the partition function for the 2D Ising model on the square lattice. Time permitting, I hope to completely solve this model.

Student Combinatorics Seminar
Monday, April 01, 2013, 4:00pm-5:00pm
3088 East Hall
Rachel Karpman (UM)

Puzzles and (equivariant) cohomology of Grassmannians

The Littlewood-Richardson numbers play an important role in symmetric function theory; in the representation theory of $GL(n)$; and in computing the cohomology of Grassmannians. Knutson and Tao's puzzle rule gives a combinatorial interpretation of these numbers which has several nice symmetries. We will introduce the Puzzle Rule and explore some of the ideas behind the proof, including a combinatorial characterization of the equivariant cohomology ring of the Grassmannian.

Student Combinatorics Seminar
Monday, April 08, 2013, 4:00pm-5:00pm
3088 East Hall
Elena Yudovina (UM)

A character-building way of computing chromatic polynomials

We will attempt to compute the chromatic polynomial of an N -by- N square grid, or at least what it looks like when N is large. By judicious use of handwaving on the one hand, and representations of the (Temperley-Lieb) algebra of squiggles on the other, we will relate this to the "six-vertex model" (think alternating sign matrices), which can be solved "exactly". Time will hopefully prevent us from having to write down the final answer.

Seminar & Events Bulletin: Student Combinatorics Seminar
01-01-2013 to 06-30-2013

Student Combinatorics Seminar
Monday, April 15, 2013, 4:00pm-5:00pm
3088 East Hall
David Benson-Putnins (UM)

Quantum Groups - why are they quantum, and what makes them groups?

Both these questions will be vaguely answered, along with an introduction to how to make your own quantum groups at home.