INdAM Intensive research period
Perspectives in Lie Theory

Program of activities

Session 3: Algebraic topology, geometric and combinatorial group theory

Period: February 8 – February 28, 2015
All talks will be held in Aula Dini, Palazzo del Castelletto.

Monday, February 9, 2015

- 10:00- 10:40, registration

- 10:40, coffee break.

- 11:10- 12:50, Vic Reiner, *Reflection groups and finite general linear groups*, lecture 1.

- 15:00- 16:00, Michael Falk, *Rigidity of arrangement complements*

- 16:00, coffee break.

- 16:30- 17:30, Max Wakefield, *Kazhdan-Lusztig polynomial of a matroid*

- 17:30- 18:30, Angela Carnevale, *Odd length: proof of two conjectures and properties* (young seminar).

- 18:45- 20:30, Welcome drink (Sala del Gran Priore, Palazzo della Carovana, Piazza dei Cavalieri)

Tuesday, February 10, 2015

- 9:50-10:40, Ulrike Tillmann, *Homology of mapping class groups and diffeomorphism groups*, lecture 1.

- 10:40, coffee break.

- 11:10- 12:50, Karen Vogtmann, *On the cohomology of automorphism groups of free groups*, lecture 1.

- 15:00- 16:00, Tony Bahri, *New approaches to the cohomology of polyhedral products*

- 16:00, coffee break.

- 16:30- 17:30, Alexandru Dimca, *On the fundamental group of algebraic varieties*

- 17:30- 18:30, Nancy Abdallah, *Cohomology of Algebraic Plane Curves* (young seminar).

Wednesday, February 11, 2015

- 9:00- 10:40, Vic Reiner, *Reflection groups and finite general linear groups*, lecture 2.

- 10:40, coffee break.

- 11:10- 12:50, Ulrike Tillmann, *Homology of mapping class groups and diffeomorphism groups*, lecture 2

- 15:00- 16:00, Karola Meszaros, *Realizing subword complexes via triangulations of root polytopes*

- 16:00, coffee break.

- 16:30- 17:30, Matthias Lenz, *Splines, lattice points, and arithmetic matroids*.

- 17:30- 18:30, Ana-Maria Brecan, *Schubert slices in the combinatorial geometry of flag domains* (young seminar).

Thursday, February 12, 2015

- 9:40- 10:40, Kang-Ju Lee, *Simplicial Tree Numbers of Matroid Complexes* (young seminar)

- 10:40, coffee break.

- 11:10- 12:50, Karen Vogtmann, *On the cohomology of automorphism groups of free groups*, lecture 2.

- 15:00- 16:00, Ivan Marin, *Report on the BMR conjectures*

- 16:00, coffee break.

- 16:30- 17:30, Masahiko Yoshinaga, Worpitzky partition, Eulerian polynomial and Linial arrangements

- 17:30- 18:30, Ivan Martino, *Subspaces arrangement of a finite group* (young seminar).

Friday, February 13, 2015

- 9:50-10:40, Ulrike Tillmann, *Homology of mapping class groups and diffeomorphism groups*, lecture 3

- 10:40, coffee break.

- 11:10- 12:50, Vic Reiner, *Reflection groups and finite general linear groups*, lecture 3.

Monday, February 16, 2015

- 9:40- 10:40, Misha Feigin, *V-systems*

- 10:40, coffee break.

- 11:10- 12:50, Karen Vogtmann, *On the cohomology of automorphism groups of free groups*, lecture 3.

- 15:00- 16:00, Alex Fink, *Polytopes and moduli of matroids over rings*

- 16:00, coffee break.

- 16:30- 17:30, Clément Dupont *Bi-arrangements of hyperplanes and Orlik-Solomon bi-complexes* (young seminar)

- 18:45- 20:30, Welcome drink of the Workshop (Sala del Gran Priore, Palazzo della Carovana, Piazza dei Cavalieri)

Workshop: Combinatorics and Algebraic Topology of Configurations – February 17-20, 2015

Tuesday, February 17, 2015

- 9:30-10:10, Toshitake Kohno, *Conformal blocks and homological representations of braid groups*

- 10:10, coffee break.

- 10:40- 11:20, Mario Marietti, *Special matchings and parabolic Kazhdan-Lusztig polynomials*

- 11:30-12:10, Bruno Benedetti, *Balinki's theorem for subspace arrangements*

- 14:30-15:10, Luis Paris, *Convexity of parabolic subgroups in Artin groups*

- 15:10, coffee break.

- 15:40-16:20, Mentor Stafa, Spaces of commuting elements in Lie groups (young seminar).

Wednesday, February 18, 2015

- 9:30-10:10, Emanuele Delucchi, *Toric arrangements and group actions on semimatroids*
- 10:10, coffee break.
- 10:20-11:00, Mattias Franz, *Some intersections of quadrics arising from division algebras*

Thursday, February 19, 2015

- 9:30-10:10, Andrew Berget, *Vector bundles over torus orbit closures in G/P*
- 10:10, coffee break.
- 10:40-12:10, Open Problem Session.
- 12:10-12:50, Takuro Abe, *Division and localization of characteristic polynomials of hyperplane arrangements*
- 14:30-15:10, Caroline Klivans, *Projection Volumes of Hyperplane Arrangements*
- 15:10, coffee break.
- 15:40-16:20, Christin Bibby TBA (young seminar).

Friday, February 20, 2015

- 9:30-10:10, Andrzej Weber, *Characteristic classes for Schubert varieties and torus action*
- 10:10, coffee break.
- 10:40-11:20, Eric Babson, TBA
- 11:30-12:10, Thomas Brady, *Triangulating the permutahedron*

Monday, February 23, 2015

- 9:30-10:30, Fatemeh Mohammadi, Divisors on graphs, orientations and system reliability (young seminar)
- 10:30, coffee break
- 11:00- 12:00, Alejandro Adem, *Representation Spaces for Central Extensions and Almost Commuting Unitary Matrices*
- 14:30- 15:30, Sonja Riedel, *Oriented Semimatroids* (young seminar)
- 15:30, coffee break.
- 16:00- 17:00, Biplab Basak, *Minimal crystallizations of 3-and 4-manifolds* (young seminar)
- 18:45- 20:30, Welcome drink of the third week (Sala del Gran Priore, Palazzo della Carovana, Piazza dei Cavalieri)

Tuesday, February 24, 2015

- 9:30- 10:30, Sergey Yuzvinsky, *The higher topological complexity of subcomplexes of products of spheres*
- 10:30, coffee break
- 11:00- 12:00, Alexandru Suciu, *Algebraic models and cohomology jump loci*
- 14:30- 15:30, Mike Davis, *The action dimension of right-angled Artin groups.*
- 15:30, coffee break
- 16:00- 17:00, Elia Saini, *Non realizable uniform phased matroids* (young seminar)

Wednesday, February 25, 2015

- 9:30- 10:30, Pavle V. M. Blagojević, *On the extended Vassiliev conjecture*

- 10:30, coffee break

- 11:00- 12:00, Stefan Papadima, *Arithmetic properties of homology jump loci*

Thursday, February 26, 2015

- 9:30- 10:30, Simona Settepanella, *Nbc minimal complex for supersolvable arrangements*

- 10:30, coffee break

- 11:00- 12:00, Suyoung Choi, *The cohomology ring of small covers and its torsion*

Friday, February 27, 2015

- 9:30- 10:30, Afshin Goodarzi, *Balinski type theorems for polytopes, cell complexes and posets*

- 10:30, coffee break

- 11:00- 12:00, Graham Denham, *Higher resonance varieties of matroids*

Abstracts

Minicourses

Victor Reiner (University of Minnesota)
Reflection groups and finite general linear groups
Abstract: Many results in the combinatorics and invariant theory of reflection groups have q-analogues for the finite general linear groups $GL_n(\mathbb{F}_q)$. These lectures will discuss several examples, and open questions arising in this context.

Ulrike Tillmann (University of Oxford)
Homology of mapping class groups and diffeomorphism groups
Abstract: Mapping class groups and diffeomorphism groups of manifolds play an important role in geometry and topology. We will discuss recent advances in the understanding of their homology exploring homotopy theoretic methods.

Karen Vogtmann (U. of Warwick, UK and Cornell University, USA)
On the cohomology of automorphism groups of free groups
Abstract: Automorphism groups of free groups bear similarities to both lattices in Lie groups and to surface mapping class groups. In this minicourse we will explore the cohomology of these groups using tools from both topology and representation theory.

Seminars

Takuro Abe (Kyoto University)
Division and localization of characteristic polynomials of hyperplane arrangements
Abstract: Freeness of line arrangements in the projective plane is intensively studied, and related to geometry and combinatorics of line arrangements. We will show that the freeness of line arrangements are related to Betti numbers of complexified complements, intersection points of lines and so on.

Alejandro Adem (University of British Columbia)
Representation Spaces for Central Extensions and Almost Commuting Unitary Matrices
Abstract: Let Q denote a central extension of a free abelian group by another free abelian group, both of finite rank. In this talk we describe the topology of the spaces of homomorphisms $\mathrm{Hom}(Q, U(m))$ and the associated moduli spaces $\mathrm{Rep}(Q, U(m))$ where $U(m)$ is the group of m by m unitary matrices.

Eric Babson (University of California at Davis)
TBA

Tony Bahri (Rider University)
New approaches to the cohomology of polyhedral products
Abstract: I shall describe geometric and algebraic approaches to the computation of the cohomology of polyhedral products arising from homotopy theory. A report on joint work with Martin Bendersky, Fred Cohen and Sam Gitler.

Bruno Benedetti (Free University Berlin)
Balinki's theorem for subspace arrangements
Abstract: A graph is called "R-connected" if between any 2 vertices one can find R vertex-disjoint paths. For example, the graph of a polygon is 2-connected. More generally, Balinski's theorem says that the graph of every d-dimensional polytope is d-connected.
Hartshorne's connectedness theorem says that arithmetically Cohen-Macaulay schemes are connected in codimension one. We show a quantitative version of this result: If X is an arithmetically Gorenstein subspace arrangement, then the dual graph of X is r-connected, where r is precisely the Castelnuovo-Mumford regularity. In the very special case when X is the Stanley-Reisner variety of the boundary of a polytope, this recovers Balinski's theorem.

If time permits, we also discuss a very recent extension to dual graphs of projective curves, which is work in progress with Matteo Varbaro and Barbara Bolognese (Northeastern).

Andrew Berget (Western Washington University)
Vector bundles over torus orbit closures in G/P
Abstract: I will present some results and conjectures on the cohomology of the restriction of homogeneous vector bundles over G/P to the T-orbit closures therein. I will discuss why such results are useful by showing their connection to certain (not torus) orbit closures in an affine space of matrices.

Pavle V. M. Blagojević (Free University Berlin / Mathematical Institute SASA Belgrade)
On the extended Vassiliev conjecture
Abstract: We present new upper bounds for the height of elements in the cohomology of the unordered configuration space $H^*(\mathrm{Conf}_n(\mathbb{R}^d)/\mathfrak{S}_n; \mathbb{F}_p)$ with coefficients in the field $\mathbb{F}_p$. In the special case when d is a power of 2 and $p = 2$ we settle the original Vassiliev conjecture by proving that $\mathrm{height}(H^*(\mathrm{Conf}_n(\mathbb{R}^d)/\mathfrak{S}_n; \mathbb{F}_2)) = d$.
As applications of these results we obtain new lower bounds for the existence of complex k-regular maps as well as for complex ℓ-skew maps $\mathbb{C}^d \to \mathbb{C}^N$.
This is joint work with F. Cohen, W. Lück, G. M. Ziegler.

Thomas Brady (Dublin City University)
Triangulating the permutahedron
Abstract: For an Artin group G of finite type we relate the $K(G, 1)$ of Salvetti with the $K(G, 1)$ given by noncrossing partitions. This is work in progress with Emanuele Delucchi and Colum Watt.

Suyoung Choi (Ajou University)
The cohomology ring of small covers and its torsion
Abstract: In this talk, we compute cohomology rings of small covers for coefficient ring $\mathbb{Q}$ or $\mathbb{Z}/q$, where q is an odd integer. In particular, we compute Betti numbers of small covers corresponding to a hyper graph. As an application, for any given odd integer $q > 1$, we construct a real toric manifold whose cohomology ring has a q-torsion.

Mike Davis (Ohio State University)
The action dimension of right-angled Artin groups
Abstract: The action dimension of a discrete group Γ is the smallest dimension of a contractible manifold which admits a proper action of Γ. Associated to any flag complex L there is a right-angled Artin group, A_L. We compute the action dimension of A_L for many L.

Emanuele Delucchi (University of Fribourg - CH)
Toric arrangements and group actions on semimatroids
Abstract: Recent work of De Concini, Procesi and Vergne on the vector partition function spurred many different directions of research. One such direction focuses on the topology of toric arrangements, another is the study of arithmetic matroids and other algebro-combinatorial structures.
In this talk I will suggest a way to establish a unifying structural framework for these two directions by considering group actions on semimatroids. On the one hand, this generalizes some important aspects of the combinatorial topology of toric arrangements; on the other hand it gives rise to new examples of abstract arithmetic matroids endowed with natural "geometric" data.

Graham Denham (University of Western Ontario)
Higher resonance varieties of matroids
Abstract: Resonance varieties of (linear) hyperplane arrangement complements have been studied extensively, and they are understood almost completely in cohomological degree 1. In higher degrees, though, the picture is quite incomplete. By regarding the Orlik-Solomon algebra as a functorial construction on a suitable category of matroids, some additional structure and new phenomena become apparent. I will give some examples and advertise some open problems.

Alex Dimca (Université Nice Sophia-Antipolis)
On the fundamental group of algebraic varieties

Abstract: We report on recent results relating the syzygies involving the partial derivatives of a homogeneous polynomial f to the geometry of the projective hypersurface $f = 0$ and the associated Milnor fiber $f = 1$.

Michael Falk (Northern Arizona University)
Rigidity of arrangement complements
Abstract: We recall the application of resonance varieties in distinguishing homotopy types of complements of complex line arrangements, and illustrate a new application whereby one reconstructs the underlying matroid from the fundamental group or cohomology ring of the complement. As an example we show the fundamental group of the complexified non-Pappus pseudo-line arrangement is not isomorphic to the fundamental group of any complex hyperplane arrangement complement. The method amounts to a combinatorial framing argument that begs generalization. This is joint work with Emanuele Delucchi.

Misha Feigin (University of Glasgow)
V-systems
Abstract: V-systems are special finite collections of vectors. They were introduced by Veselov in 1999 in the study of special solutions of Witten-Dijkgraaf-Verlinde-Verlinde equations, and they have natural geometrical definitions. The class of V-systems has nice properties of being closed under taking subsystems and under taking projections to the intersections of the corresponding hyperplanes. Various examples are known which include Coxeter root systems but there is no classification. After reviewing this information I also plan to discuss a more recent study of a subclass of harmonic V-systems. The talk is based on joint works with A. Veselov.

Alex Fink (Queen Mary University of London)
Polytopes and moduli of matroids over rings
Abstract: Matroids over rings were introduced by Luca Moci and the speaker as a common generalisation of valuated matroids and arithmetic matroids. This talk reports on a continuation of that work. After introducing matroids over rings and their principal known manifestations, we fully explain the structure of matroids over valuation rings. This leads to a cryptomorphic characterisation in terms of polytopes, and a construction of their parameter space with a tropical Schubert calculus flavour. A few yet-unreconciled clues hint at the existence of a Coxeter generalisation.

Matthias Franz (University of Western Ontario)
Some intersections of quadrics arising from division algebras
Abstract: I will present a small family of intersections of quadrics involving the normed real division algebras. These spaces are smooth manifolds and come with a canonical action of the 2-torus $G = \{\pm 1\}^n$. They turn out to be equivariantly homeomorphic to the real version of the "mutants of compactified representations" introduced by Franz and Puppe, which implies that their equivariant cohomology has interesting features. Moreover, these quadrics can be realized as intersections of products of spheres with linear subspaces, and they are diffeomorphic to connected sums of products of spheres. If time permits, I will discuss some generalizations of the construction.

Afshin Goodarzi (Royal Institute of Technology)
Balinski type theorems for polytopes, cell complexes and posets
Abstract: The classical Steinitz's theorem asserts that a graph G is the underlying graph of a 3-polytope if and only if G is 3-connected and planar. In 1961, Balinski extended the "only if" direction of Steinitz's theorem by showing that the underlying graph of a d-polytope is d-connected. In this talk, based on a recent joint work with Karim Adiprasito and Matteo Varbaro and a work in progress with Anders Björner, I will present several generalisations of Balinski's theorem. If time permits an application to finite Coxeter groups will be given.

Caroline Klivans (Brown University)
Projection Volumes of Hyperplane Arrangements
Abstract: We considered certain projection volumes of polyhedral cones. Our main result shows that the average projection volumes of cones of a hyperplane arrangement are given by the coefficients of the associated characteristic polynomial. In the case of Coxeter arrangements, the exact volumes are given

by the coefficients. These results naturally relate to those of De Concini and Procesi, Stembridge, and Denham which establish the relationship for 0-dimensional projections. Joint work with Mathias Drton and Ed Swartz.

Toshitake Kohno (Graduate School of Mathematical Sciences, the University of Tokyo)
Conformal blocks and homological representations of braid groups
Abstract: We show that specializations of the homological representationsof braid groups are equivalent to the monodromy of the KZ equation with values in the space of null vectors in the tensor product of Verma modules when the parameters are generic. Here the representations of the solutions of the KZ equation by hypergeometric integrals due to Schechtman, Varchenko and others play an important role. By this construction we recover quantum symmetry of the monodromy of KZ connection due to Drinfel'd and myself by means of the action of the quantum groups on twisted cycles. In the case of special parameters corresponding to conformal field theory, we give a description of twisted cycles.

Matthias Lenz (University of Oxford)
Splines, lattice points, and arithmetic matroids
Abstract: Formulas of Khovanskii-Pukhlikov, Brion-Vergne, and De Concini-Procesi-Vergne relate the volume with the number of integer points in a convex polytope. In this talk I will refine these formulas and talk about graded vector spaces that appear naturally in this context, the Dahmen-Micchelli spaces and their duals, the so-called P-spaces. It will turn out that the combinatorics of these spaces is determined by the underlying arithmetic matroid. The talk will be based on `arXiv:1408.4041`.

Mario Marietti (Universit Politecnica delle Marche)
Special matchings and parabolic Kazhdan-Lusztig polynomials
Abstract: We show how the combinatorial concept of special matching can be used to compute the parabolic Kazhdan-Lusztig polynomials of doubly laced Coxeter groups and of dihedral Coxeter groups. In particular, for this class of groups which includes all Weyl groups, we generalize to the parabolic setting certain results of Brenti, Caselli, and myself. As a consequence, the parabolic Kazhdan-Lusztig polynomial indexed by u and v depends only on the poset structure of the lower Bruhat interval $[e, v]$ and on which elements of that interval are minimal coset representatives.

Ivan Marin (Université de Picardie-Jules Verne)
Report on the BMR conjectures
Abstract: During the nineties, M. Broué, G. Malle and R. Rouquier proposed a series of conjectures in order to generalize the classical setting of real reflection groups (Coxeter groups, Artin groups, Hecke algebras) to complex reflection groups. I will report on the state-of-art concerning these conjectures, including recent progress by G. Pfeiffer and myself on the one hand, by my student E. Chavli on the other hand.

Carola Meszaros (Cornell University)
Realizing subword complexes via triangulations of root polytopes
Abstract: Subword complexes are simplicial complexes introduced by Knutson and Miller to illustrate the combinatorics of Schubert polynomials and determinantal ideals. They proved that any subword complex is homeomorphic to a ball or a sphere and asked about their geometric realizations. We show that a family of subword complexes can be realized geometrically via triangulations of root polytopes. This implies that a family of β-Grothendieck polynomials are special cases of reduced forms in the subdivision algebra of root polytopes. Based on joint work with Laura Escobar.

Stefan Papadima (IMAR)
Arithmetic properties of homology jump loci
Abstract: I will discuss connections between the algebraic monodromy action in characteristic zero and homology jump loci in positive characteristic

Luis Paris (Universit de Bourgogne)
Convexity of parabolic subgroups in Artin groups

Simona Settepanella (Hokkaido University)
Nbc minimal complex for supersolvable arrangements

Alexandru Suciu (Northeastern University)
Algebraic models and cohomology jump loci

Abstract: A cornerstone of the theory of cohomology jump loci is the Tangent Cone theorem, which relates the behavior around the origin of the characteristic and resonance varieties of a space. I will revisit this theorem, in both the algebraic setting provided by cdga models, and in the topological setting provided by fundamental groups and cohomology rings. When the spaces in question are either smooth, quasi-projective varieties, or closed three-dimensional manifolds, the respective jump loci are much more tightly connected, albeit in different ways.

Max Wakefield (United States Naval Academy)
Kazhdan-Lusztig polynomial of a matroid

Abstract: We study a few different perspectives (combinatorics, geometry, and algebra) of a new polynomial attached to a matroid. First we define the polynomial combinatorially and compute it for certain examples. Then we will discuss how the polynomial arose out of the study of the intersection cohomology of the reciprocal plane (i.e. the Spectrum of the Orlik-Terao algebra). If time permits we will discuss an algebraic interpretation through a deformed Mobius algebra. This polynomial closely resembles the Kazhdan-Lusztig polynomial attached to a Coxeter group. Thought there are significant differences, the similarities are striking.

Andrzej Weber (University of Warsaw)
Characteristic classes for Schubert varieties and torus action

Abstract: The Hirzebruch class of a complex manifold is characteristic class whose integral is equal to the χ_y-genus. The construction admits a generalization for singular varieties. The equivariant version of the Hirzebruch class can be developed as well. The general theory applied in the situation when a torus acts on a singular variety allows to apply tools as Localization Theorem of Atiyah-Bott and Berline-Vergne. We obtain a meaningful invariant of a germ of singularity. When it is made explicit it turns out that the result is just a polynomial in characters of the torus. In particular, the Hirzebruch class can be computed for combinatorially defined objects. Among others the toric varieties or Schuber cells are of special interest. The issue of positivity of coefficients in a certain expansion remains mysterious.

Masahiko Yoshinaga (Hokkaido University)
Worpitzky partition, Eulerian polynomial and Linial arrangements

Abstract: We will formulate a generalization of the classical Worpitzky identity in terms of partition of coweight lattice points and generalized Eulerian polynomial introduced by Lam and Postnikov. This can be applied to express characteristic polynomials of the Linial arrangements. Then we will discuss a conjecture by Postnikov and Stanley on the location of zeros of the characteristic polynomials. This talk is based on `arXiv:1501.04955`

Sergey Yuzvinsky (University of Oregon, Eugene)
The higher topological complexity of subcomplexes of products of spheres

Abstract: We consider polyhedral product space that is a subcomplex of product of spheres whose dimensions are of the same parity. For such a space we compute the s-topological complexity. In particular it gives the complexity of the complement to a complex general position arrangement of hyperplanes. It turns out that this complexity is determined by the simplicial complex from the structure of the product space (that is a skeleton of a simplex in case of an arrangement complement). The results have been obtained jointly with Jesus Gonzalez and Barbara Gutierrez.

Young seminars

Nancy Abdallah (Université Nice Sophia-Antipolis)
Cohomology of Algebraic Plane Curves

Biplab Basak (Indian Institute of Science, Bangalore)
Minimal crystallizations of 3-and 4-manifolds

Abstract: We have introduced the weight of a group which has a presentation with number of relations is at most the number of generators. We have shown that the number of vertices of any crystallization

of a connected closed 3-manifold M is at least the weight of the fundamental group of M. We have also constructed crystallization of $L(kq1, q)$ with $4(q + k1)$ vertices for $q \geq 3$, $k \geq 2$ and $L(kq + 1, q)$ with $4(q + k)$ vertices for $q \geq 4$, $k \geq 1$. By a recent result of Swartz, our crystallization of $L(kq + 1, q)$ are minimal when $kq + 1$ are even. Also, we have provided a minimal crystallization of the standard PL K3 surface. In combination with known results this yields minimal crystallizations of all simply connected PL 4-manifolds of "standard" type, that is, all con- nected sums of $\mathbb{CP}^2$, $S^2 \times S^2$, and the K3 surface. In particular, we obtain minimal crystallizations of a pair of homeomorphic but non-PL-homeomorphic 4-manifolds.

Christin Bibby (University of Oregon)
TBA

Ana-Maria Brecan (Jacobs University Bremen)
Schubert slices in the combinatorial geometry of flag domains

Angela Carnevale (Università di Roma Tor Vergata)
Odd length: proof of two conjectures and properties

Clément Dupont (MPIM Bonn)
Bi-arrangements of hyperplanes and Orlik-Solomon bi-complexes

Kang-Ju Lee (Seoul National University)
Simplicial Tree Numbers of Matroid Complexes

Ivan Martino (University of Fribourg - CH)
Subspaces arrangement of a finite group
Abstract: In this talk, I discuss the arrangements of subspaces arising naturally from a representation of a finite group. We show that they are useful to compute the class of the classifying stack of a group in a certain Grothendieck ring.

Fatemeh Mohammadi (University of Osnabrück)
Divisors on graphs, orientations and system reliability

Sonja Riedel (University of Bremen)
Oriented Semimatroids
Abstract: A toric arrangement is a finite family $\mathcal{A}$ of special subtori of codimension one in the torus $(\mathbb{C}^*)^n$ or $(S^1)^n$. Recent work of De Concini and Procesi generated new interest in combinatorial invariants of the topology of the complement of a toric arrangement.
Starting from the theory of semimatroids and oriented matroids, we want to develop toric oriented matroids as abstract characterisation of arrangements of topological subtori in the compact torus $(S^1)^n$ with a view towards generalising known topological results about the complement $M(\mathcal{A}) = (S^1)^n \setminus \cup \mathcal{A}$ using the toric Salvetti complex associated to the face categories of such toric pseudoarrangements.

Elia Saini (University of Fribourg - CH)
Non realizable uniform phased matroids

Mentor Stafa (Tulane University)
Spaces of commuting elements in Lie groups