FU	Robert Thijs Kozma	New Density Bounds and Optimal Ball Packings for Hyperbolic Space	In this talk we consider horoball packings of hyperbolic spaces. We introdude the notion of horoball type, and demonstrate its utility by showing the nonuniqueness result for optimal ball packing configurations of $\mathbb{H}^3$. We proceed to show that it is possible to exceed the conjectured 4-dimensional packing density upper bound due to L. Fejes-T\'oth (Regular Figures, 1964). We give several examples of horoball packing configurations that yield higher densities of ≈ 0.71644896 where horoballs are centered at the ideal vertices of certain Coxeter simplex tilings.
FU	Bennet Goeckner	A non-partitionable Cohen-Macaulay complex	In joint work with Art Duval, Caroline Klivans, and Jeremy Martin (my advisor), we construct a non-partitionable Cohen-Macaulay simplicial complex, which disproves a longstanding conjecture by Stanley. Due to an earlier result of Herzog, Jahan, and Yassemi, this construction also disproves the conjecture that Stanley depth is always greater than or equal to depth.
FU	Charu Goel	Some applications of sum of squares representations of even symmetric forms	In 1888, Hilbert gave a complete characterisation of the pairs $(n,2d)$ for which a n-ary $2d$-ic form non-negative on $\mathbb{R}^n$ can be written as sums of squares of other forms, namely $\mathcal{P}_{n,2d}$ = $\Sigma_{n,2d}$ if and only if $n=2, d=1$, or $(n,2d)=(3,4)$, where $\mathcal{P}_{n,2d}$ and $\Sigma_{n,2d}$ are respectively the cones of positive semidefinite (psd) and sum of squares (sos) forms (real homogenous polynomials) of degree $2d$ in n variables. This talk presents our analogue of HilbertÕs characterisation under the additional assumptions of even symmetry on the given form, and few applications of sos representations of even symmetric forms. We show that for the pairs $(n,2d)=(3,2d)_{d \geq 6}, (n,8)_{n \geq 5}$ and $(n,2d)_{n \geq 4, d \geq 7}$ there are even symmetric psd not sos n-ary $2d$-ic forms. Moreover, assuming the existence of even symmetric psd not sos n-ary decics and dodecics for $n \geq 4$, we establish that an even symmetric n-ary $2d$-ic psd form is sos if and only if $n=2$ or $d=1$ or $(n,2d)=(n,4)_{n \geq 3}$ or $(n,2d)= (3,8)$. We then give necessary and sufficient conditions for an even symmetric sos form to be a sum of binomial squares (sobs) for the pairs $(n,2), (2,2d)_{d=2,3}, $ $(n,4)_{n \geq 3}$ (using Ghasemi-Marshall's coefficient tests) and show that for the pairs $(2,2d)_{d\geq 4}, (3,8)$ there exists even symmetric sos forms that are not sobs. Finally we interpret our results on even symmetric psd forms not being sos in terms of preorderings. This talk is partially based on joint work with S. Kuhlmann and B. Reznick.
TU	Zeljka Stojanac	Tensor theta norms	The tensor nuclear norm is NP-hard to compute and thus not suitable for applications such as low rank tensor recovery. To overcome this problem, it has been suggested to use sums of nuclear norms of matricizations of the corresponding tensor. However, this approach does not respect well the tensor structure. We introduce new tensor norms (theta norms) whose unit-norm balls are convex relaxations of the tensor unit nuclear norm ball. These norms are computable in polynomial time via semidefinite programming. This approach is based on the theta bodies – a recent concept from computational algebraic geometry – which relies heavily on the Groebner basis of an appropriately defined polynomial ideal. We explicitly give semidefinite programs for the computation of the θ_k-norm. We also present numerical experiments for order three tensor recovery via θ_1-norm minimization. This is joint work with Holger Rauhut, available at http://arxiv.org/abs/1505.05175 .
TU	Zafeirakis Zafeirakopoulo	Polyhedral Omega: A linear Diophantine system solver	Polyhedral Omega is a new algorithm for solving linear Diophantine systems (LDS), i.e., for computing a multivariate rational function representation of the set of all non-negative integer solutions to a system of linear equations and inequalities. Polyhedral Omega combines methods from partition analysis with methods from polyhedral geometry. In particular, we combine MacMahon's iterative approach based on the Omega operator and explicit formulas for its evaluation with geometric tools such as Brion decomposition and Barvinok's short rational function representations. In this way, we connect two branches of research that have so far remained separate, unified by the concept of symbolic cones which we introduce. The resulting LDS solver Polyhedral Omega is significantly faster than previous solvers based on partition analysis and it is competitive with state-of-the-art LDS solvers based on geometric methods. Most importantly, this synthesis of ideas makes Polyhedral Omega by far the simplest algorithm for solving linear Diophantine systems available to date. This is joint work with Felix Breuer.

TU	Judit Abardia	The role of the Rogers-Shephard inequality in the characterization of the difference body	The difference body of a convex body is defined as the Minkowski sum of the convex body with its symmetric with respect to the origin. Different characterization results are known for the difference body operator. These characterization results rely on the basic properties of the difference body such as continuity, additivity, SL(n)-covariance, Minkowksi valuation or symmetric image. It is known that the volume of the difference body of a convex body is bounded from above and from below by the volume of the body itself. The (sharp) upper bound is known as Rogers-Shephard inequalty. The (sharp) lower bound follows from the Brunn-Minkowski inequality. In this talk we will discuss the role of both inequalities in characterizing the difference body operator. For instance, we will prove that it is the only operator from the space of convex bodies to the origin-symmetric ones which is continuous, GL(n)-covariant and satisfies a Rogers-Shephard inequality. Finally, we will show how the situation changes if the hypothesis of GL(n)-covariance is removed. This a joint ongoing project with Andrea Colesanti and Eugenia Saorín Gómez.