Abstracts

Embeddings between objects associated to surfaces

Javier Aramayona, NUI Galway

To a surface one can associate a number of objects, notably its Teichmuller space, its mapping class group, and various graphs of simple closed curves. A natural problem is then to understand all possible embeddings between two such objects, that is, between two Teichmuller spaces / mapping class groups / graphs of curves. In this talk we will discuss this problem and present some recent progress on it. Parts of this work are joint work with Chris Leininger and Juan Souto.

Enumerating integral points in polytopes

Thomas Hüttemann, Queen's University Belfast

I will discuss a striking result of Michel Brion which solves, in a certain sense, the problem of enumerating integral points in a polytope with integral vertices, and a generalisation of this result to virtual polytopes (also known as line bundles on complete toric varieties).

K3 surfaces with special involutions

Madeeha Khalid, St Patrick's College Drumcondra

K3 surfaces are an interesting class of complex surfaces which also appear in theoretical physics. Some K3 surfaces admit an anti-symplectic involution. These have a special geometry and are also a key ingredient in the construction of Borcea-Voisin(BV) Calabi-Yau threefolds. We classify families of K3 surfaces with anti-symplectic involutions, which are also orbifold limits. Conformal Field Theories(CFTs) on orbifold K3s are well understood. We plan to extend these CFTs to their associated three dimensional BV Calabi-Yau manifolds in future work. Nikulin has classified K3 surfaces with anti-symplectic involutions in terms of 2-elementary lattices and their invariants. There is no natural way, however, of describing a K3 surface associated to a given lattice with prescribed invariants. We give the geometric realisation of K3 surfaces associated to four different isomorphism classes of lattices. In this talk we illustrate these ideas with the aid of our main example, namely the Kummer K3 surface, and present our most recent results.

Riemannian submersions from simple compact Lie groups

Martin Kerin, University of Münster

Due to their appearance in several areas of Riemannian geometry, it is important to understand Riemannian submersions. As a particularly interesting case, one would like to determine the structure of all Riemannian submersions from compact Lie groups G which are equipped with a bi-invariant metric. In this talk we will construct, in infinitely many dimensions, such Riemannian submersions so that the base cannot be a quotient of G by a group action. In particular, this (possibly surprising) result shows that the structure problem is more difficult than might have been expected. This is joint work with Ravi Shankar.

Flows of equivariant cmc tori in the 3-sphere

Martin Kilian, University College Cork

I will discuss a deformation technique for constant mean curvature (cmc) tori in the 3-sphere, and as a first application use it to study the moduli space of equivariant cmc tori in the 3-sphere. In particular this leads to the classification of the minimal tori, as well as the embedded, and the Alexandrov embedded cmc tori amongst the equivariant tori in the 3-sphere.

3-manifolds, codes, and arithmetic

Mathias Kreck, Hausdorff Mathematics Institute, Bonn

Let M be a closed odd-dimensional manifold with involution,with finitely many fixed points. Puppe has associated to M a self-dual binary code $C(M, \tau)$ and asked the question which codes occur in this way. I will explain self-dual codes, their relation to arithmetic and answer the question above and related questions. Motivated by the answer we define a (new?) construction of self-dual codes. If there is time, I will also study codes over the Gaussian integers mod 2 which come from orientation-preserving involutions on 3-manifolds.

Retracts and Extensions

John McCarthy, Washington University, St Louis

Let V be a subset of the bidisk in $\mathbb{C}^2$. If V is a holomorphic retract, then any bounded analytic function on V can be extended to a function of the same size on the bidisk. Is the converse true? The answer turns out to depend on a study of the geodesics for the Kobayashi metric. The main result comes from an operator theory paper written with Jim Agler that appeared in the Annals of Mathematics several years ago, but I shall try to emphasize the geometric aspects and include some open problems in complex geometry.

TBA

Werner Nahm, Dublin Institute for Advanced Studies

The Hilbert geometry of convex polytopes

Constantin Vernicos, NUI Maynooth

Hilbert geometries are a natural generalisation of Klein's model of the Hyperbolic geometry, and they are related to Hilbert's fourth problem, i.e., the characterisation of metric geometries whose geodesics are straight lines. In this talk, after an introduction to these geometries, we will focus on the classification of the quasi-isometric classes, in particular we will deal with the special case of convex polytopes which was settled , independently, by A. Bernig and myself.
