

ABSTRACTS

Anchouche, Boudjemaa (Sultan Qaboos University, Oman)

Orbital measures on $SU(n)/SO(n)$.

Sunday 7 December 2014, 14:45 – 15:15.

Let $U_n = SU(n)$, $K_n = SO(n)$ and let $N_{U_n}(K_n)$ be the normalizer of K_n in U_n . Let ν_a be some normalized singular measure supported in $K_n a K_n$, where a is in $U_n \setminus N_{U_n}(K_n)$, and denote by $\nu_a^{(p)}$, the convolution of p copies of ν_a . In a joint paper with S. Gupta and A. Plagne, it was proved that the Radon-Nikodym derivative of $\nu_a^{(p)}$ with respect to the Haar measure μ_{U_2} on U_2 , is in $L^2(U_2)$ if and only if $p \geq 3$, hence providing a counterexample to the dichotomy conjecture which says that either $d\nu_a^{(p)}/d\mu_{U_n}$ is singular or is in $L^2(U_n)$. The aim of the talk is to give an overview of these results.

Berdinsky, Dmitry (The University of Auckland, New Zealand)

On the Willmore-like functionals in Thurston geometries.

Sunday 7 December 2014, 16:00 – 16:30.

We will present the Willmore-like functionals for surfaces in Thurston geometries with four-dimensional group of isometries. In particular, we will show that the CMC spheres in these geometries satisfy the Euler-Lagrange equation for such functionals.

Dearricott, Owen (Australian Catholic University, Australia)

Quaternion-Sasakian manifolds and reduction

Friday 5 December 2014, 14:45 – 15:45.

An n -Sasakian manifold is a Riemannian manifold foliated by equidistant n -dimensional totally geodesic leaves such that the Riemann tensor is that of a curvature one space form on any triple of vector fields that include a field tangent to the leaves of the foliation. Such manifolds are intimately connected to the parallel even Clifford orbifolds of Moroianu and Semmelmann. We discuss an analogue of 3-Sasakian reduction in this setting. It turns out in this general setting actions amenable to reduction are somewhat sparse. However the Quaternion-Sasakian case ($n = 3$) has a rich supply that include inhomogeneous examples, reduction in this case closely ties back in with the 3-Sasakian reductions of Boyer, Galicki and Mann.

We also touch on some examples of 7-Sasakian circle reduction.

Globke, Wolfgang (The University of Adelaide, Australia)

Compact pseudo-Riemannian solvmanifolds.

Saturday 6 December 2014, 15:15 – 16:15.

A compact solvmanifold M is a quotient of a solvable Lie group G by a cocompact closed subgroup H . A pseudo-Riemannian metric on M is induced by an H -invariant symmetric 2-tensor on G . In this talk I will describe some foundations and results of my ongoing work with Oliver Baues on the nature of this 2-tensor and what it can imply for the subgroup H .

Gordon, Carolyn (Dartmouth College, USA)

Inverse spectral problems in the presence of group actions.

Friday 5 December 2014, 10:00 – 11:00, 11:15 – 12:15.

Kim, Kang-Tae (Pohang University of Science and Technology, Korea)

Positivity and completeness of the Bergman metric on unbounded pseudoconvex domains in \mathbb{C}^n .

Sunday 7 December 2014, 9:30 – 10:30.

The talk will be based on the recent preprint arXiv:1411.2753.

Holomorphic vector fields on a non-flat infinite contact type CR hypersurface germ.

Sunday 7 December 2014, 10:30 – 11:30.

Noncompact holomorphic automorphism group and its action has been a subject of much interest in complex geometry. Bounded domains with noncompact automorphism group have been one of my main research interests. I will present a brief survey on this line of thoughts and results. Large part of presentation is based upon my recent paper with Ninh Van Thu of the SRC-GAIA: [Trans. A.M.S. Feb 2015 (Available electronically)].

Leistner, Thomas (The University of Adelaide, Australia)

Locally homogeneous pp-waves.

Saturday 6 December 2014, 14:15 – 15:15.

We show that every n -dimensional locally homogeneous pp -wave is a plane wave, provided it is indecomposable and its curvature operator, when acting on 2-forms, has rank greater than one. As a consequence we obtain that indecomposable, Ricci-flat locally homogeneous pp -waves are plane waves. This generalises a classical result by Jordan, Ehlers and Kundt in dimension 4. Several examples show that our assumptions on indecomposability and the rank of the curvature are essential.

Medvedev, Alexandr (University of New England, Australia)

Differential invariants of ODEs systems of higher order.

Sunday 7 December 2014, 13:45 – 14:15.

We found a complete set of fundamental invariants for systems of ordinary differential equations of order ≥ 4 under the group of point transformations generalizing similar results for contact invariants of a single ODE and point invariants of a system of the 2nd and the 3rd order.

To obtain results we use theory of geometric structures on filtered manifold and Cartan connections. This allows us to transfer main difficulty to essentially algebraic computations of special Lie algebra cohomologies associated with the problem.

This is joint work with Boris Doubrov.

Millionschikov, Dmitry (Moscow State University, Russia)

Invariant geometric structures on nilmanifolds.

Saturday 6 December 2014, 10:30 – 11:30.

Massey products in Lie algebra cohomology.

Saturday 6 December 2014, 11:45 – 12:45.

Payne, Tracy (Idaho State University, USA)

A Computational Method for Classifying Real Nilpotent Lie Algebras.

Friday 5 December 2014, 13:45 – 14:45.

We discuss a computational method for classifying real nilpotent Lie algebras. The class of nilpotent Lie algebras is completely different from the semisimple class: nilpotent Lie algebras lack any graceful structure, and they have few isomorphism invariants that distinguish one from another. In low dimensions, there are only finitely many nilpotent Lie algebras up to isomorphism, but in dimensions seven and higher, there are continuous families of nonisomorphic Lie algebras.

The key to our approach is to consider subclasses which admit a distinguished derivation with positive eigenvalues, the “pre-Einstein” derivation defined by Yuri Nikolayevsky, which is related to the study of soliton metrics on nilmanifolds. In this setting, a convenient basis exists and there are effective isomorphism invariants.

Nilpotent Lie algebras in dimensions seven and less have been classified. We present classifications of large subclasses of real nilpotent Lie algebras in dimension eight. This involves finding explicit parametrizations for continuous families. We can also say which of the corresponding simply connected nilmanifolds admit soliton metrics.

Pulemotov, Artem (The University of Queensland, Australia)

Boundary-value problems for the Ricci flow.

Friday 5 December 2014, 16:00 – 16:30.

The Ricci flow is a second-order partial differential equation describing the evolution of a Riemannian metric on a manifold. This equation is particularly famous for its key role in the proof of the Poincaré Conjecture. Understanding the Ricci flow on manifolds with boundary is a difficult problem with applications to a variety of fields, such as topology and mathematical physics. The talk will survey the current progress towards the resolution of this problem. In particular, we will discuss new results concerning spaces with symmetries.

Rubinstein, Hyam (The University of Melbourne, Australia)

Minimal surfaces in hyperbolic 3-manifolds.

Saturday 6 December 2014, 9:30 – 10:30.

Schmalz, Gerd (University of New England, Australia)

Chern-Moser theory for para-CR-manifolds and degenerate multicontact structures.

Sunday 7 December 2014, 11:45 – 12:15.

A 3-dimensional non-degenerate para-CR manifold is nothing but the solution manifold of a second order ODE and its geometry has been thoroughly studied under different names and in various contexts. I will present an approach analogous to Chern-Moser normal forms for non-degenerate and degenerate para-CR manifolds. This is joint work with Alessandro Ottazzi (Trento)

The, Dennis (Australian National University, Australia)

Homogeneous integrable Legendrian contact structures in dimension five.

Sunday 7 December 2014, 15:30 – 16:00.

Given a contact manifold, a splitting of the contact distribution into a direct sum of two Legendrian sub-distributions is called a Legendrian contact structure. In the integrable (or “ILC”) case, an equivalent local description is as a compatible complete system of second order PDEs on a single unknown function of many independent variables and considered up to point transformations. This geometry is a natural generalization of the classical geometry of scalar second order ODE.

I will describe recent joint work with Doubrov and Medvedev that gives a complete classification of all (complex) ILC structures in dimension five that are multiply transitive, i.e. homogeneous and having at least six-dimensional symmetry algebra. In this dimension, the fundamental (harmonic) curvature is particularly easy to compute and most multiply transitive structures admit a simple PDE representation.

Tsartsafis, Ioannis (La Trobe University, Australia)

A bijection in cohomology of filiform Lie algebras over \mathbb{Z}_2 .

Friday 5 December 2014, 16:30 – 17:00.

Let $\mathfrak{m}_0(n) = \text{Span}(e_1, \dots, e_n)$ with Lie brackets $[e_1, e_i] = e_{i+1}$ for $i \geq 2$ and $\mathfrak{m}_2(n) = \text{Span}(e_1, \dots, e_n)$ with Lie brackets $[e_1, e_i] = e_{i+1}$ for $i \geq 2$ and $[e_2, e_j] = e_{j+2}$ for $j \geq 3$, be finite dimensional Lie algebras over \mathbb{Z}_2 . In this talk we will show that \mathfrak{m}_2 and \mathfrak{m}_0 have the same Betti numbers over \mathbb{Z}_2 .

van der Kamp, Pieter (La Trobe University, Australia)

Integrable Curvature Evolution.

Saturday 6 December 2014, 16:30 – 17:00.

Starting from an action of a Lie group on a manifold, the Fels-Olver moving frame method provides a set of generating invariants together with their syzygies. One of the syzygies gives us the evolution of curvature invariants if an evolution of curves is specified. Another syzygy gives us an invariant symmetry condition which can be utilised to identify integrable curvature evolution.

Vyatkin, Yuri (The University of Auckland, New Zealand)

Conformal Invariants of Hypersurfaces.

Sunday 7 December 2014, 16:30 – 17:00.

The notion of conformal invariants of hypersurfaces will be discussed and some ways of manufacturing such invariants using a version of the conformal tractor calculus will be presented.

Zaitsev, Dmitri (Trinity College Dublin, Ireland)

Convergent normal forms for real hypersurfaces.

Sunday 7 December 2014, 14:15 – 14:45.

This is a report on a joint work with Ilya Kossovsky. We construct a complete convergent normal form for a real hypersurface in \mathbb{C}^n at generic Levi degeneracy. In particular, we obtain, in the spirit of the work of Chern and Moser distinguished curves in the Levi degeneracy set, that we call degenerate chains. More recently, we have extended our normal forms and degenerate chains to certain higher type points in \mathbb{C}^2 .