

Analysis on Manifolds with Symmetries and Related Structures

28 and 29 June 2016

Programme of the workshop

Tuesday 28 June, afternoon session

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|---------------|--------------------|---------------------|
| 13:30 - 14:30 | Clotilde Fermanian | see §2. |
| 14:30 - 15:00 | – | <i>Coffee break</i> |
| 15:00 - 16:00 | Marcello Seri | see §9 |
| 16:00 - 17:00 | Alessio Martini | see §5 |

Dinner at 18:45: Tilleys Bistro

3 North Parade Passage, Bath BA1 1NX,
in the centre of Bath, close to the Abbey and the Roman Baths.

Wednesday 29 June, morning session

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|---------------|-------------------|---------------------|
| 9:00 - 10:00 | Michael Ruzhansky | see §7 |
| 10:00 - 10:30 | – | <i>Coffee break</i> |
| 10:30 - 11:30 | Simon Scott | see §8 |
| 11:30 - 12:30 | Eugenie Hunsicker | see §4 |

Lunch break (13:30 - 14:30)

Suggestion: follow the locals to the various options in Building 2W.

Wednesday 29 June, afternoon session

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|---------------|-----------------|---------------------|
| 13:30 - 14:30 | Toshi Kobayashi | see §3 |
| 14:30 - 15:00 | – | <i>Coffee break</i> |
| 15:00 - 16:00 | Cho-Ho Chu | see §1 |
| 16:00 - 17:00 | Michael Pevzner | see §6 |

Venue: All the talks will take place in Lecture Theatre 1.1 of 6 West.

The coffee breaks will be served in the lecture theatre or close by.

The speakers and their talks

1. Professor Cho-Ho Chu (Queen Mary University of London, UK)

Jordan structures in symmetric manifolds

Abstract: The importance of Lie algebras in geometry is well-known. However, the role of Jordan algebras in geometry seems less recognised. We will discuss the connections of Jordan algebras to Lie algebras and symmetric manifolds, including the infinite dimensional ones, as well as some recent applications.

2. Professor Clotilde Fermanian-Kammerer (Université Paris-Est & INSMI-CNRS, France)

Dispersive estimates for the Schrödinger operator on step 2 stratified Lie groups

Abstract: We discuss a result obtained with Hajer Bahouri and Isabelle Gallagher which states a dispersive estimates on stratified Lie groups of step 2, for the linear Schrödinger equation involving a sublaplacian. We identify a property of the canonical skew-symmetric form under which we establish optimal dispersive estimates. The rate depends on the dimension of the center of the group, and of the radical of the canonical skew-symmetric form.

3. Professor Toshiyuki Kobayashi (University of Tokyo, Japan)

Global Geometry and Analysis on Locally Symmetric Spaces with Indefinite-metric

Abstract: The local to global study of geometries was a major trend of 20th century geometry, with remarkable developments achieved particularly in Riemannian geometry. In contrast, in areas such as pseudo-Riemannian geometry, familiar to us as the spacetime of relativity theory, and more generally in pseudo-Riemannian geometry of general signature, surprising little is known about global properties of the geometry even if we impose a locally homogeneous structure.

I plan to explain two programs:

(global shape) Existence problem of compact locally homogeneous spaces, and deformation theory,

(spectral analysis) Construction of periodic eigenfunctions for the Laplacian for indefinite-metric, and discuss the stability of eigenvalues under the deformation of the geometric structure,

by taking anti-de Sitter manifolds as a typical example.

4. Dr Eugenie Hunsicker (University of Loughborough, UK)

An approach to pseudodifferential operators for locally symmetric spaces

Abstract: Hermitian locally symmetric spaces are a collection of manifolds with very rich structure. Using their algebraic structure, it has been possible to prove remarkable analytic results about them, in particular the Zucker conjecture identifying their space of L^2 harmonic forms with intersection cohomology of a particular compactification.

Geometrically, these spaces have a particular asymptotic structure involving stacks of fibre bundles. The work described here is aimed at exploiting this geometric structure to develop a pseudodifferential operator calculus containing parametrices for fundamental geometric operators on these spaces.

5. Dr Alessio Martini (University of Birmingham, UK)

Spectral multipliers on NA groups

Abstract: Let $G = N \rtimes A$, where N is a stratified group and $A = \mathbb{R}$ acts on N via automorphic dilations. Homogeneous sub-Laplacians on N and A can be lifted to left-invariant operators on G and their sum is a sub-Laplacian Δ on G . In joint work with A. Ottazzi and M. Vallarino (arXiv:1504.03862, to appear in J. Anal. Math.) we prove a theorem of Mihlin-Hörmander type for spectral multipliers of Δ . The proof hinges on a Calderón-Zygmund theory à la Hebisch and Steger (Math. Z. 245 (2003), 37-61) adapted to the sub-Riemannian structure of G and on gradient heat kernel estimates for the sub-Laplacian Δ .

6. Professor Michael Pevzner (Université de Reims Champagne-Ardenne, France)

Symmetry breaking operators for differential forms

Abstract: We shall present recent results on symmetry breaking operators for infinite dimensional representations of reductive Lie groups. More precisely, we shall give a complete classification of all conformally covariant differential operators between the spaces of i -forms on the sphere S^n and j -forms on the totally geodesic hypersphere S^{n-1} . This construction gives rise to matrix valued analogues of celebrated Rankin-Cohen brackets.

7. Professor Michael Ruzhansky (Imperial College London, UK)

Multipliers of groups

8. Professor Simon Scott (King's College London, UK)

Spectral Geometric Invariants and Analytic-Torsion in TQFT

Abstract: We will present a class of logarithmic-representations on the bordism category whose characters yield various exotic analytic-torsions, including Chern characters, indices of elliptic operators and higher signatures, with an inbuilt functorial structure corresponding to pasting formulae.

9. Dr Marcello Seri (UCL & University of Reading, UK)

A sub-Riemannian Santal formula and applications

Abstract: we prove a sub-Riemannian version of the classical Santal formula: a result in integral geometry that describes the intrinsic Liouville measure on the unit cotangent bundle in terms of the geodesic flow. In the talk I will focus on the meaning of the result and describe some direct applications like (p-)Hardy-type and isoperimetric-type inequalities for a compact domain with sufficiently regular boundary, and curvature independent lower bound for the first Dirichlet eigenvalue of the intrinsic sub-Laplacian and of magnetic Laplace-Beltrami operators. If time permits we will discuss how this leads to prove quantum trapping by volume explosion. (joint works with D. Prandi and L. Rizzi).