Harmonic Analysis and Partial Differential Equations

30 June 2016

Programme of the meeting

Morning session:

10:30 - 11:00	*Welcome*	*with tea and coffee*
11:00 - 12:00	Fulvio Ricci	see §3

Lunch break (12:00 - 13:30)

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

Wednesday 30 June, afternoon session

13:30 - 14:05	Chiara Taranto	see §4
14:15 - 14:50	David Beltran	see §2
15:00 - 15:30	–	*Coffee break*
15:30 - 16:05	Odysseas Bakas	see §1
16:15 - 16:50	Marco Vitturi	see §5

Venue: All the talks will take place in Lecture Theatre 1.1 of 6 West.
The coffee breaks will be served in the foyer of 6 West, beside the lecture theatre.

Speakers with the titles and abstracts of their talks

1. Odysseas Bakas (University of Edinburgh)

   Classical inequalities of Paley and Zygmund: weighted and higher dimensional versions revisited

   Abstract: We recall some classical inequalities of Paley and Zygmund for functions on the circle and then examine higher dimensional versions for functions of several variables. Weighted inequalities will also be discussed.

2. David Beltran (University of Birmingham)

   Weighted inequalities for oscillatory Fourier multipliers

   Abstract: Motivated by a long-standing conjecture of Stein for the disc multiplier, we present L^2-weighted inequalities for broad classes of highly-singular Fourier multipliers on $\mathbb{R}^d$ satisfying regularity hypotheses adapted to scales finer than dyadic. The weights in the inequality are related via geometrically-defined maximal operators, involving fractional averages associated with certain approach or escape regions.

   Our framework applies to solution operators for dispersive PDE, such as the time-dependent free Schrödinger equation, and other highly oscillatory convolution operators that fall well beyond the scope of the Calderón–Zygmund theory.

   If time permits, we will discuss some progress on analogous results for pseudodifferential operators associated to the exotic Hörmander symbol classes.

   This is joint work with Jon Bennett.

3. Professor Fulvio Ricci (Scuola Normale Superior, Pisa, Italy)

   Fourier and spectral analysis

   Abstract: The Fourier transform is the most important tool for studying linear operators on functions on $\mathbb{R}^n$ which commute with translations. This establishes a close connection between Fourier analysis and joint spectral theory of the fundamental translation invariant operators given by the n partial derivatives. This principle can be extended to more general situations which exhibit invariance under a group action.

4. Chiara Taranto (Imperial College London)

   Well-posedeness of the sub-Laplacian wave equation on stratified Lie groups and Sub-Laplacian Gevrey Spaces

   Abstract: In a recent work [3], C. Garetto and M. Ruzhansky investigate the Cauchy problem for the time-dependent wave equation for sums of squares of vector fields on compact Lie groups. In particular, they establish the well-posedness in spaces that compare to the Gevrey spaces. In this talk a generalisation of their result to all stratified Lie groups is presented. Furthermore, modelled on the spaces of Gevrey-type appearing in [3], we define the sub-Laplacian Gevrey spaces on manifolds and partially characterise these spaces. Finally we consider the case of the Heisenberg group, which allows us to give a full characterisation for the sub-Laplacian Gevrey spaces.

   References

   [1] D. Dasgupta, M. Ruzhansky, Gevrey functions and ultradistributions on compact Lie groups and homogeneous spaces, Bulletin des Sciences Math- matiques, 138 (2014), 756-782.

   [2] V. Fischer, M. Ruzhansky, Quantization on Nilpotent Lie Groups, Progress in Mathematics, Birkhauser, 2016.

   [3] C. Garetto, M. Ruzhansky, Wave equation for sum of squares on compact Lie groups, J. Differential Equations, 258 (2015), 4324-4347.

5. Maro Vitturi (University of Edinburgh)

   Uniform estimates for the double Hilbert transform along a polynomial surface in the Heisenberg group

   Abstract: We develop an L^2 theory for the double Hilbert transform along a polynomial surface in the Heisenberg group. Whereas the analogous 2-parameter singular integral in euclidean $\mathbb{R}^3$ is only bounded depending on the Newton diagram of the polynomial, the operator in the Heisenberg group always is. However, when we ask for uniformity in the polynomial coefficients we recover the euclidean phenomenon. In the talk I will mainly concentrate on some ideas that occur in the proof.