Journées SL_2R

Institut Élie Cartan de Lorraine (UMR CNRS 7502)
Université de Lorraine

March 21–22, 2019

Conferences:
Petit Amphi, Bâtiment de l'UFR MIM, Université de Lorraine
3 rue Augustin Fresnel, 57070 Metz

Program

Thursday, March 21

13:40–13:45	*Opening of the workshop*
13:45-14:35	Werner MÜLLER: *Asymptotic distribution of automorphic spectra and the trace formula*
14:45–15:35	Victor NISTOR *Group Actions and essential spectra of operators*
15:45–16:15	*Coffee Break*
16:20-17:10	Philippe MEYER: *Representations associated to gradations of colour Lie algebras*
17:20-18:10	Valentin OVSIENKO: *What is... a* q*-deformed rational number?*
19:45	*Dinner : Brasserie Les Arts et Métiers, 2 Bis Rue Gambetta, 57000 Metz.* *Phone: 03 87 55 94 95*

Friday, March 22

9:00–9:50	Genkai ZHANG: *Branching rule of representations of Lie groups and boundary value problems*
10:00-10:30	*Coffee break*
10:30–11:20	Vincent PECASTAING: *Conformal actions in pseudo-Riemannian signature*
11:30-12:20	Pavle PANDZIC: *Dirac cohomology for* D*-modules*
12:30	*Lunch at the IECL*

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Titles and abstracts of the talks:

Philippe MEYER:
Representations associated to gradations of colour Lie algebras

Abstract: Colour Lie algebras generalise both Lie algebras and Lie superalgebras. In this talk, after recalling the definition of a colour Lie algebra, we give a necessary and sufficient condition for the existence of a quadratic colour Lie algebra structure on $\mathfrak{g} \oplus V$, where V is an orthogonal representation of a quadratic colour Lie algebra $\mathfrak{g}$. This theorem involves an invariant taking its values in the exterior algebra of V and generalises results of Kostant (1999) and Chen-Kang (2015). We then introduce the notion of a special orthogonal representation V of a quadratic colour Lie algebra $\mathfrak{g}$ and show that for such a representation one can define a quadratic colour Lie algebra structure on $\mathfrak{g} \oplus \mathfrak{sl}(2,k) \oplus V \otimes k^2$. Finally we give examples of special orthogonal representations of Lie algebras amongst which are: a one-parameter family of representations of $\mathfrak{sl}(2,k) \times \mathfrak{sl}(2,k)$; the 7-dimensional fundamental representation of a Lie algebra of type G_2 and the 8-dimensional spinor representation of a Lie algebra of type $\mathfrak{so}(7)$.

Werner MÜLLER:
Asymptotic distribution of automorphic spectra and the trace formula

Abstract:
For a given lattice in a semisimpe Lie G we consider the discrete spectrum of the right regular representation of G in L^2 of the corresponding coset space. In this talk I will discuss the behavior of the discrete spectrum with respect to the growth of various parameters such as the level of congruence subgroups or/and theinfinitesimal character. This is closely related to the study of families of automorphic forms in the sense of Sarnak. A number of results are known for $GL(n)$ and the issue is to extend these results to other groups. The main technical tool is the Arthur trace formula.

Victor NISTOR
Group Actions and essential spectra of operators

Abstract:
I will give an overview of a general theory that reduces the calculation of the essential spectrum of an operator obtained from the action of a group on a space in terms of the usual spectra of operators on orbits at infinity.

Valentin OVSIENKO
What is... a q-deformed rational number?

Abstract:
The answer to this question is missing in the literature. Our answer is based on the combinatorial properties of continued fractions. The main idea is to deform the continued fraction expansion of a rational number, keeping its relations to hyperbolic geometry and the modular group $PSL(2,\mathbb{Z})$. The defined notion of q-rationals extends that of q-integers, leading to polynomials in q with positive integer coefficients satisfying a certain 'total positivity' property. The coefficients of these polynomials have a nice combinatorial interpretation.
The talk is based on a joint work with Sophie Morier-Genoud.

Pavle PANDZIC:
Dirac cohomology for $\mathbb{D}$*-modules*

Abstract:
It is well known that it is useful for the study of Harish-Chandra modules corresponding to admissible representations of a real reductive Lie group G to consider their geometric counterparts, the $\mathcal{D}$-modules on the flag variety of the complexified Lie algebra of G. On the other hand, there is a new useful invariant of Harish-Chandra modules, Dirac cohomology, which among other things can be related to unitarity of the modules in question. In a recent joint work with Wolfgang Soergel, we attempt to define a geometric version of Dirac cohomology that applies to $\mathcal{D}$-modules, and study its various properties.

Vincent PECASTAING :
Conformal actions in pseudo-Riemannian signature

Abstract:
In the 1980's, major results of Zimmer initiated a research program about actions of higher-rank semi-simple Lie groups and their lattices on manifolds endowed with geometric structures. It was conjectured that these actions share common features with standard algebraic models.
A natural setting in which Zimmer obtained many striking results was for volume-preserving actions. However, the non-volume preserving case was less understood.
I will discuss this topic in the context of pseudo-Riemannian geometry. Isometries are volume preserving, and their actions are well described since the 1980's. Essentially, a lot of them are built with homogeneous spaces G/Γ with their Killing metrics.
However, conformal maps do not preserve a volume in general, and their actions were less understood. More recent results of Bader-Nevo and Frances-Zeghib classified them when the real-rank is large. In this talk, I will present new results for conformal actions of rank 1 simple Lie groups. We will see that in this case, the "standard model" is a Fefferman fibration over the visual boundary G/P. If time permits, I will also mention recent progress about actions of higher-rank lattices.

Genkai ZHANG:
Branching rule of representations of Lie groups and boundary value problems

Abstract:
We study branching problems of unitary representations of a rank one Lie group under a symmetric subgroup. We construct explicitly irreducible components in the branching and we find its application to certain mixed boundary value problems for some conformally invariant differential operators including Branson-Gover operators.
(Joint work with Jan Frahm and Bent Orsted.)

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