Abstracts

Quadratic overgroups for Diamond Lie groups

Lobna Abdelmoula

Let G be a connected and simply connected solvable Lie group. The moment map for π in $\widehat{G}$, unitary dual of G, sends smooth vectors in the representation space of π to $\mathfrak{g}^*$. The closure of the image of the moment map for π is called its *moment set*, denoted by I_π. Generally, the moment set I_π, $\pi \in \widehat{G}$ does not charcterize π, even for generic representations. However, we say that $\widehat{G}$ is *moment separable* when the moment sets differ for any pair of distinct irreducible unitary representations. In the case of an exponential solvable Lie group G, D. Arnal and M. Selmi exihibited an accurate construction of an overgroup G^+, containing G as a subgroup and an injective map Φ from $\widehat{G}$ into $\widehat{G^+}$ in such a manner that $\Phi(\widehat{G})$ is moment separable and $I_{\Phi(\pi)}$ characterizes π, $\pi \in \widehat{G}$. In this work, we provide the existence of a quadratic overgroup for the diamond group, which is the semi-direct product of $\mathbb{R}^n$ with $2n+1$-dimensional Heisenberg group for some $n \geq 1$. This is a joint work with Yasmine Bouaziz.

Diamond cone for classical Lie superalgebras

Boujemaâ Agerbaoui

Let $\mathfrak{g}$ be a semisimple Lie algebras and $\mathfrak{n}^+$ its nilpotent factor in the Iwasawa decomposition. Each simple finite dimensional $\mathfrak{g}-$ modules is caracterized by its highest weight $\lambda \in \Lambda = \{\sum_{i=1}^{n} a_i w_i,\ a_i \in \mathbb{N}\}$ where w_i are fundamental weights. We denote it by $\mathbb{S}^\lambda$. In classical Lie algebras, each $\lambda = \sum_{i=1}^{n} a_i w_i$ is the shape of a young diagram $Y(\lambda)$ (i columns of hight i). The fillings of $Y(\lambda)$ to semistandard Young tableaux indexing a basis $SST(\lambda)$ of $\mathbb{S}^\lambda$. The space

$\mathbb{S}^\bullet := \sum_{\lambda\in\Lambda}\mathbb{S}^\lambda$, is a quotient of $S(\sum_{i=0}^{n}\mathbb{S}^{w_i})$ called the shape algebra and $SST(\Lambda) = \bigcup_{\lambda\in\Lambda} SST(\lambda)$ is a basis.
Representations of classical Lie superalgebras, initiated by V. Kac, are closed to those of classical Lie algebras, simple finite dimensional modules are highest weight modules $\mathbb{S}^\lambda$. The modules realized as submodules of the tensor algebra of the natural module have basis indexed by the family of semistandard Young tableaux of shape λ. The shape algebra is defined analogously.
If $\lambda' \leq \lambda$, $\mathbb{S}^{\lambda'}|_{n^+}$. The reduced shape algebra $\mathbb{S}^\bullet_{red} := \bigcup_{\lambda\in\Lambda}\mathbb{S}^\lambda|_{n^+}$ has a basis indexed by the so called quasistandard tableaux $QST(\Lambda)$ and respecting the stratification that is $QST(\lambda') \subset QST(\lambda)$. Each $T' \in QST(\lambda')$ is extracted from $T \in SST(\lambda)$ through the use of the 'jeu de taquin' giving a bijection $p_\lambda : SST(\lambda) \to \bigcup_{\lambda'\leq\lambda} QST(\lambda')$. The diamond cone is by definition the collection of all quasistandard tableaux. A program to construct the diamond cone was completed for $\mathfrak{sl}(m)$, $\mathfrak{sp}(2n)$, $\mathfrak{so}(2n+1)$, the rank 2 semisimple Lie algebras and $\mathfrak{sl}(m,1)$, $\mathfrak{sl}(m,n)$ and $\mathfrak{spo}(2n,2m+1)$ to (see [ABW, AAB, AAB1, AAK, AAK1, AK, ?]).

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Invariants réels d'un pinceau en courbe de genre 2

Mouadh Akriche

Je donne les invariants déterminants d'une manière unique la classe réelle d'un pinceau en courbes de genre 2. Avant de donner la preuve de notre résultat principal, j'expliquerai les invariants de la classe complexe de tel pinceau dans le contexte analytique (Celui de **Y. Namikawa** et **K. Ueno** puis dans le contexte algébrique (celui de **E. Viehweg**). (Travail en collaboration avec **S. Moulahi**).

Hom-Gerstenhaber algebras up to homotopy

Walid Aloulou

We study the concept of algebra up to homotopy for a structure defined by two operations. An important example of such a structure is the Gerstenhaber algebra(commutatitve and Lie). The notion of Gerstenhaber algebra up to homotopy (G8-algebra) is known. In this paper, we give a Hom-Gerstenhaber algebra defined by a structure of commutative and Hom-associative algebra and a structure of a Hom-Lie algebra. We will give an explicit construction of the associated Hom-Gerstenhaber algebra up to homotopy, this is a bicoalgebra (Hom-coLie and Hom-coassociative) equipped with a codifferential which is a coderivation for the two coproducts allowing the construction of HomG8-algebra.

On Beurling's Theorem for compact extensions of $\mathbb{R}^n$

Salma Azaouzi

Based on a note of N. Wiener, a classical theorem of Hardy proved in 1933 states that an integrable function on the real line and its Fourier transform $\hat{f}$ cannot both have arbitrary Gaussian decay unless f is identically zero. More precisely, if both $f(x)e^{\alpha x^2}$ and $\hat{f}(x)e^{\beta x^2}$ are bounded for some $\alpha, \beta > 0$ then the following conclusions hold:

1. $f = 0$ whenever $\alpha\beta > 1/4$.
2. The function f is a constant multiple of $e^{-\alpha x^2}$ when $\alpha\beta = 1/4$.
3. When $\alpha\beta < 1/4$, there are infinitely many linearly independent functions satisfying both conditions.

One year after, G. Morgan expanded the Hardy theorem by using generalized Gaussian functions. He proved that if we take p' and q' real numbers such that $p' > 2$ and $1/p' + 1/q' = 1$ and f a measurable function on $\mathbb{R}^n$ such that $e^{\alpha\|\cdot\|^{p'}} f$ and $e^{\beta\|\cdot\|^{q'}} \hat{f}$ are bounded, then f is null almost everywhere whenever $(\alpha p')^{\frac{1}{p'}} (\beta q')^{\frac{1}{q'}} > sin(\frac{\pi}{2}(q'-1))^{\frac{1}{q'}}$.
A few years later appeared another sharp interpretation of Wiener remark, the so-called Heinsenberg inequality which statement is:

$$\inf_{\alpha,\beta} \int (x-\alpha)^2 |f(x)|^2 dx \int (\xi-\beta)^2 |\hat{f}(\xi)|^2 d\xi \geq \frac{\|f\|_2^4}{4}.$$

During the years after, many authors have shown several formulating ways of the uncertainty principle. One beautiful result among them is the Beurling-Hörmander Theorem published in 1991, which states that if an integrable function f satisfies the condition :

$$\int_{\mathbb{R}} \int_{\mathbb{R}} |\widehat{f}(y)||f(x)|e^{|xy|} dx dy < \infty.$$

Then $f = 0$ almost everywhere. This result was generalized in the case of nilpotent Lie groups (A. Baklouti, N. BenSalah, K. Smaoui, 2004 : the case of connected simply connected nilpotent Lie groups, A. Baklouti, N. BenSalah, 2008 : the case of 2-NPC nilpotent Lie groups, K. Smaoui, 2011 : the case of nilpotent Lie groups, AMA. Ghamdi, A. Baklouti, 2015 : the case of

exponential solvable Lie Groups). Now let K be a compact subgroup of automorphisms of $\mathbb{R}^n$, I will propose in this presentation a formulation of Beurling's Theorem for compact extensions of $\mathbb{R}^n$ which are the semi-direct products $K \ltimes \mathbb{R}^n$.

Deforming a locally Euclidean geometry.

Souhail Bejar

Let G be a Lie group and H a connected closed subgroup of G. Given any discontinuous subgroup Γ for the homogeneous space $\mathscr{M} = G/H$ and any deformation of Γ, the deformed discrete subgroup may utterly destroy its proper discontinuous action on $\mathscr{M}$ whenever H is not compact. We treat in this talk the case where $G := O_n(\mathbb{R}) \ltimes \mathbb{R}^n$ stands for the Euclidean motion groups. We study the deformation spaces of any discrete Γ acting properly discontinuously and fixed point freely on G/H for an arbitrary H. Remarkably, it happens that H turns to be compact whenever Γ is infinite, which means that the proper action resists to any deformation of Γ but probably the free action does not. Furthermore the parameter space has a quite complicated topological features imposing a distinction of two types of stability. The situation where Γ is a crystallographic subgroup is extensively studied. This is a joint work with Ali Baklouti.

Spectral synthesis for coadjoint orbits of nilpotent Lie groups

Ingrid Beltita

For every connected and simply connected nilpotent Lie group G, and every unitary irreducible representation π of G, we study the space $\mathcal{I}_\pi$ of primary ideals of $L^1(G)$ with hull $\{\pi\}$. We show that there exists a finite dimensional space of polynomials on G whose G-invariant subspaces are in bijection with $\mathcal{I}_\pi$. This talk reports on joint work with Jean Ludwig.

Variants of Müntz-Szàsz analogues for Euclidean spin groups.

Sabria Ben Ayed

Given a strictly increasing sequence of positive integers $(n_k)_k$, the Müntz-Szàsz theorem for completeness of the monomials $\{x^{n_k}\}$ in $L^2([0,1])$ can be extended to Euclidean spin groups, being the universal coverings of Euclidean motion groups $SO(n) \ltimes \mathbb{R}^n$. Towards such an objective, we rephrase the condition of the completeness in terms of an integral against the monomials $\{x^{n_k}\}$ of the coordinates functions associated to the Garding vectors of G, whose Fourier transform are shown to admit an analytic continuation to the whole complex plane with an exponential domination. This allows us to formulate and prove several variants of Müntz-Szàsz's Theorem in these settings. These upshots are proved using the Plancherel theory related to the group Fourier transform.

Turán type inequality for q-special functions.

Mariem Ben Said

In this talk I would like to present some Turán type inequalities for modified q-Bessel function (q-MBF). In order to obtain the main results we apply the methods developed in the case of classical modified Bessel functions.
Moreover, we establish Turán type inequalities for q-Bessel Macdonald functions (q-BMF) by using a q-version of Schwartz inequality.

The Hardy space H^1 in the rational Dunkl setting.

Néjib Ben Salem

This paper consists in a first study of the Hardy space H^1 in the rational Dunkl setting. Following Uchiyama's approach, we characterizee H^1 atomically and by means of the heat maximal operator. We also obtain a Fourier multiplier theorem for H^1. These results are proved here in the one-dimensional case and in the product case.

Superior order Poincaré-type inequality related to the Jacobi semigroup.

Abdellatif Bentaleb

The aim objective of this note is to study the heat Jacobi semigroup generated by the operator $Lf(x) := (1-x^2)f'' + [(\beta-\alpha) - (\alpha+\beta+2)x]f', \alpha, \beta > -1$, acting on the Hilbert space $\mathbb{L}^2([-1,+1],\mu)$ with respect to the normalized the Jacobi probability measure $\mu(dx) = c(1-x)^\alpha(1+x)^\beta dx$. We use some basic properties of the semigroups $\{\exp(t\prod_{k=0}^{n}(L-k(k+\alpha+\beta+1)))\}_{t\geq 0}, n \geq 0$, to analyze a large family of geometric inequalities that does not exist in the literature and with which reinforced the (integral) Poincaré inequality.
Mathematics Subject Classification (2000). Primary 42A76, 47D07, 31A35; Sacondary 60J25, 60E15, 60J45.
Keywords and phrases. Jacobi operators, heat semigroup, Spectral gap, Poincaré inequality, Superior order Poincaré-type inequality.

Modules of bilinear differential operators over the orthosymplectic superalgebra $\mathfrak{osp}(1|2)$.

Taher Bichr

T. Bichr* J. Boujelben† K. Tounsi‡

Let $\mathfrak{F}_\lambda$, $\lambda \in \mathbb{C}$, be the space of tensor densities of degree λ on the supercircle $S^{1|1}$. We consider the superspace $\mathfrak{D}_{\lambda_1,\lambda_2,\mu}$ of bilinear differential operators from $\mathfrak{F}_{\lambda_1} \otimes \mathfrak{F}_{\lambda_2}$ to $\mathfrak{F}_\mu$ as a module over the orthosymplectic superalgebra $\mathfrak{osp}(1|2)$. We prove the existence and the uniqueness of a canonical conformally equivariant symbol map from $\mathfrak{D}^k_{\lambda_1,\lambda_2,\mu}$ to the corresponding space of symbols. An explicit expression of the associated quantization map is also given.

Bilinear differential operators: Projectively equivariant symbol and quantization maps.

Jamel Boujelbène

We study the space of bilinear differential operators on weighted densities as a module over $sl(2;\mathbb{R})$. We introduce the corresponding space of symbols and we prove the existence and the uniqueness of canonical projective equivariant symbol and quantization.

Poisson transform on homogeneous vector bundles.

Abdelhamid Boussejra

We study the L^p-range of the Poisson transform on the homogeneous vector bundles over the complex and the quaternionic hyperbolic spaces.

Deforming discontinuous subgroups of $3-$step nilpotent Lie groups.

Mariem Boussoffara

Let G be a Lie group, H a closed subgroup of G and a discret subgroup of G. We consider the deformation space $\mathscr{T}(\Gamma, G, H)$ of a discontinuous group Γ for the homogeneous space G/H. There are many natural questions about the structure and the topological and geometric features of $\mathscr{T}(\Gamma, G, H)$. We interprete this phenomenon in the case where G is a $3-$step nilpotent Lie group we provide an explicit description of the parameter and the deformation spaces of any discrete group Γ acting properly discontinuously and fixed point freely on G/H. We give a stratification of the deformation space which depends upon the dimensions of $G-$adjoint orbits. The topological features of deformations, such as the stability and the Hausdorff property of $\mathscr{T}(\Gamma, G, H)$ are also discussed.

The Philosophy of Mathematical Modeling and Numerical Simulation: Surprises from the Wave Equation and its Finite Difference Models.

James B. Cole

1. **Philosophy of Modeling:**
   Contrary to what one might suppose, the best model is not the one that most accurately fits the data. Rather, a good model is simple (has few parameters - Occam's razor), has the essential mathematical behavior of the system it is supposed to model, and predicts phenomena that have yet to be observed.

2. **The Wave Equation and its Finite Difference Models:**
   The wave equation is based on a simplified model of a stretched string and is derived using elementary Newtonian mechanics, yet it is invariant under the Lorentz (but not the Galilean) transformation - and hence "predicts" special relativity. The second-order finite difference (FD) model of the wave equation is less accurate than a fourth-order one, but it is a much better model of the wave equation. Its numerical stability condition implies a finite upper limit on signal propagation, but it can also tell us something about the geometry of space-time. We introduce what is called the nonstandard (NS) FD model of the wave equation and show that its stability condition depends on the dimensionality and connectivity of the space-time grid. A physical light signal in a medium, in which the speed of light is lower than its vacuum, speed has a precursor wave that propagates with the vacuum speed of light. When an FD model is used to compute signal propagation in a medium with a propagation velocity lower than that of free space, a precursor is also seen, the velocity of which depends on the geometry of the space-time grid. On a space-time grid, the finite size of the cells gives rise to dispersion in the FD model. Thus if physical space-time were also quantized, the FD model predicts dispersion. It is unclear, however, whether or not this could be measured if it exists.

3. **Green's Function Methods for Broadband Solutions**
   NS-FDTD is exact for any combination of wave number (k) and angular frequency (w) that satisfy $\sin(w\Delta t/2)/\sin(kh/2) = u$, where $0 < u \leq 1$ is a real constant and $h = \Delta x = \Delta y = \Delta z$, thus we can solve the inhomogeneous finite difference model of the wave equation using a discrete Green's function that (in the one-dimensional form) satisfies

   $$(d_\tau^2 - u^2 d_\chi^2) g_{\chi,\chi'}^{\tau-\tau'} = \delta_{\chi,\chi'}\delta_{\tau,\tau'}.$$

   Although the Green's function for a differential equation with boundary conditions is usually difficult or impossible to find analytically, can be found using NS-FDTD. To the extent that the NS-model is exact model of the wave equation this Green's function by convolution with the source gives an exact solution to the inhomogeneous wave equation.

Solvability on Riemanien symmetric spaces.

Radhouane Daher

We study the exixtence of fundamental solutions for certain invariant linear differential operators on simply connected riemannian symmetric spaces S. We prove that an invariant differential operator on S admits a fundamental solution if and only if its partial Fourier coefficients satsfy a condition of slow growth.

Note on the cortex of some exponential Lie groups.

Béchir Dali

In this paper, we built a family of 4d-dimensional two-step nilpotent Lie algebras $(\mathfrak{g}_d)_{d\geq 2}$ so that the cortex of the dual of each $\mathfrak{g}_d$ is a projective algebraic set. This example consists a generalization of the 8-dimensional two-step nilpotent Lie algebra given in "Irreductible representation of locally compact group that cannot be Hausdorff separated from the identity representation" (Bekka and Kaniuth) and in which the authors show that the cortex of the dual of the given Lie algebra is a quadric. In our case, we show that the cortex of the dual $\mathfrak{g}_d^*$ of each $\mathfrak{g}_d$ is a projective algebraic set given by:

$$Cor(\mathfrak{g}_d^*) = \{\ell = (z_i, y_i, x_i) \in \mathfrak{g}_d^* : \ z_i = 0, \ y_{2d-1}\Big(\sum_{i=1^{d-1}} y_{2i}\prod_{j=1}^{d-1} y_{2j-1} = 0\Big)\}.$$

We also give some remarks on the cortex of the Lie group $\mathbb{R}^n \ltimes \mathbb{R}$.

On the restriction of discrete series of a real reductive Lie group to a subgroup locally isomorphic to $SL(2, R)$.

Michel Duflo

We consider a reductive real connected Lie group G, and a discrete series representation π of G (this means that π is unitary, irreducible, and has square integrable coefficients). We determine the subgroups H of G,locally isomorphic to $SL(2, R)$, such that the restriction of π to H is admissible (this means that, as a representation of H, it is a –possibly infinite– direct sum of irreducible representations of H occurring with finite multiplicities). This is a joint work with Esther Galina and Jorge A. Vargas.

Asymptotic spherical analysis

Jacques Faraut

If G is a locally compact group and K a compact subgroup, the pair (G, K) is called a Gelfand pair if the convolution algebra $L^1(K\backslash G/K)$ of K-biinvariant integrable functions on G is commutative. A K-biinvariant continuous function φ on G is said to be spherical if

$$\int_K \varphi(xky)dk = \varphi(x)\varphi(y)$$

(dk is the normalized Haar measure of the compact group K.)

An Olshanski spherical pair (G, K) is the inductive limit of an increasing sequence (G_n, K_n) of Gelfand pairs. A K-biinvariant continuous function φ on G is said to be spherical if

$$\lim_{n\to\infty} \int_{K_n} \varphi(xky)dk = \varphi(x)\varphi(y).$$

The spherical dual Ω of the Olshanski spherical pair (G, K) is the set of spherical functions of positive type. What is the relation of the spherical dual Ω with the sequence Ω_n of the spherical duals of the Gelfand pairs (G_n, K_n) ? We have no general answer, but we will give answers for some examples.

Study of some deformation spaces of connected nilpotent Lie groups.

Sonia Ghaouar

We study some problems bound to the theory of deformation of the discontinuous subgroups on the solvable homogeneous spaces such as topological problems like the stability and the rigidity, and geometrical problems. We treat the cases of reduced Heisenberg Lie group, the product of reduced Heisenberg Lie groups and the reduced threadlike Lie group.

Intertwining operators for representations induced from subgroups of nilpotent Lie groups.

Amira Ghorbel

Let G be a connected and simply connected two-step nilpotent Lie group and let Γ be a co-compact discrete subgroup of G. A new decomposition into irreducibles of the quasi-regular representation $R_\Gamma = \mathrm{Ind}_\Gamma^G 1$ of G is given. We describe also an intertwining operator which does not take into account the multiplicities of the decomposition. Finally, we give an explicit intertwining operator between the two representations R_{Γ_1} and R_{Γ_2} induced from two representation equivalent subgroups Γ_1 and Γ_2.

Beta-hypergeometric probability distribution on symmetric matrices.

Abdelhamid Hassairi

We first give some properties based on independence relations between matrix beta random variables of the first kind and of the second kind which are satisfied under a condition on the parameters of the distributions. We then use results on Jordan algebras and their symmetric cones to introduce a class of matrix-variate beta-hypergeometric distributions containing the beta ones as a particular case. We show that with these distributions, the proprieties established for the beta are satisfied without any condition on the parameters. The results involve many remarkable properties of the zonal polynomials with matrix arguments and the use of random matrix continued fractions.

L^p-Fourier transforms on compact extensions of unimodular Lie groups.

Junko Inoue

Let G be a unimodular Lie group of type I and $\widehat{G}$ be the unitary dual of G. We are concerned with the L^p-Fourier transform $\mathcal{F}^p = \mathcal{F}^p(G)$ on G for exponents $1 < p \leq 2$ and $q = p/(p-1)$, which is defined as a continuous operator $\mathcal{F}^p : L^p(G) \to L^q(\widehat{G})$ by the Hausdorff-Young theorem generalized by Kunze for non-abelian groups. In this talk, we study the norm $\|\mathcal{F}^p(G)\|$ of the L^p-Fourier transform. We treat the case when G is a compact extension of a unimodular Lie group N of type I and obtain that the norm satisfies $\|\mathcal{F}^p(G)\| \leq \|\mathcal{F}^p(N)\|$. This is a joint work with Ali Baklouti.

On the space of holomorphic equivalence classes of bounded homogeneous domains.

Hideyuki Ishi

Piatetskii-Shapiro constructed a family of mutually non-biholomorphic 7-dimensional bounded homogeneous domains parametrized by a closed bounded interval. His construction made use of a family of homogeneous embeddings from 2-dimensional unit ball into the Siegel disk of rank 4. Inspired by this method, we shall discuss how to parametrize holomorphic equivalence classes of n-dimensional bounded homogeneous domains. Since bounded homogeneous domains are in one-to-one correspondence with normal j-algebras up to natural isomorphisms, the problem is reduced to a close investigation of the root space decomposition of normal j-algebras.

Intertwining operators for holomorphic multiplier representations ans their infinitesimal generators.

Souheyl Jendoubi

Given a Lie group G acting two domains D_1 and D_2 in $\mathbb{C}^n$ and let ζ, η be holomorphic functions on D_1 such that $\eta(D_1) \subset D_2$ and $\zeta : D_1 \to$. We determine necessary and sufficient conditions on ζ, η in order that the weighted composition operator $W_{\zeta,\eta}$ induced by ζ and η be an intertwining operator for certain reducible holomorphic Lie group representations having the form

$$(T_g^{(j)} F)(z) \ = \ h_g^{(j)}(z) F\big(k_g^{(j)}(z)\big), \quad g \in G, \ j = 1, 2,$$

where $h_g^{(j)} : D_j \to$ are holomorphic functions, called the automorphic factors and $k_g^{(j)} : D_j \to D_j$ are biholomorphic automorphisms of D_j. We give a solution of the this problem in the case when D_1 is homogeneous. Furthermore, we examine conditions on ζ, η to ensure that $W_{\zeta,\eta}$ is also an intertwining operator for the infinitesimal representation of $T_g^{(j)}$ given by

$$\big(\rho^{(j)}(v)F\big)(z) = \frac{d}{d\epsilon}\Big|_{\epsilon=0} T_{g_\epsilon}^{(j)} F(z) = \big(H^{(j)}(v)F\big)(z) + b^{(j)}(v)(z)F(z),$$

where $(g_\epsilon)_{\epsilon \in \mathbb{R}}$ is a smooth one-parameter subgroup of G, $v \in \mathcal{G} = T_e G$, $H^{(j)}(v)$ is an holomorphic vector field and $b^{(j)}(v)$ is an holomorphic function.
As an analogy of change of coordinates on a Riemannian surface, the intertwining identity allow us to establish a relationship between the structure constants for pairs of the following Lie bracket vector fields, $[H^{(j)}(v)\,,\, H^{(j)}(w)]$, $[\frac{d}{dz}\,,\,[H^{(j)}(v)\,,\, H^{(j)}(w)]\,]$ and $[\frac{d}{dz}\,,\,[\frac{d}{dz}\,,\,[H^{(j)}(v)\,,\, H^{(j)}(w)]\,]\,](z) - \big[\,[\frac{d}{dz}\,,\, H^{(j)}(v)]\,,\,[\frac{d}{dz}\,,\, H^{(j)}(w)]\,\big]$.

Inequalities in Clifford-Fourier Analysis.

Rim Jday

Recently, there has been an interest on generalizations of the Fourier transform. Specially there is a focus on the so-called Clifford-Fourier transform introduced by Sommen. In this context, many research are devoted to find similar results to the classical Fourier transform for the Clifford-Fourier transform. In 2011, De Bie and Xu clarify the Clifford-Fourier transform by several properties and an integral expression given by:

$$\mathfrak{F} - (f)(x) = (2\pi)^{\frac{-m}{2}} \int_{\mathbb{R}^m} K - (y, x) f(y) dy,$$

where

$$K - (y, x) = \exp(i\frac{\pi}{2}\Gamma_x)\exp(-i\langle y, x\rangle).$$

In this paper, according to the work of De Bie and Xu, we add further properties to the the Clifford-Fourier transform: we provide the Riemann-Lebesgue lemma, in addition we prove that the the Clifford-Fourier transform is bounded in $C(\mathbb{R}^m, (1 + |x|)^{\frac{-(m-2)}{2}})$ and we state a version of Young's inequalities for the the Clifford-Fourier transform.

On a Solutions of D'Alembert's Functional Equation.

Samir Kabbaj

The aim of this conference is to give the solutions of the following functional equations:

$$\sum_{k=0}^{n-1} f(x\sigma^k(y)) = nf(x)f(y) \qquad (I)$$

where $x, y \in G$ which is a compact group, $n \in \mathbb{N}^*$ and σ is a continous authormophism of G, such that $\sigma^n = I_G$. We express the solutions in terms of unitary charachters of G.

$$\int_G \{f(x+y-t) + f(x-y+t)\} d\mu(t) = f(x) + f(y) \qquad (II)$$

where $(G, +)$ is a locally compact abelian Hausdorff group, and μ is a regular compactly supported complex-valued Borel measure on G such that $\mu(G) = \frac{1}{2}$.

$$\int_G f(xty) d\mu(t) + \int_G f(\sigma(y)tx) d\nu(t) = 2f(x)g(y) \qquad (III)$$

where G is a locally compact group, σ is a continious involution of G and μ and ν are a complex bounded and σ-invariant measures. In the end, I will investigate the superstability of this functional equation.

Keywords: Fourier transform, Unitary representation of a compact group, Cauchy, D'Alembert and Welson Functional Equation, Quadratic and Additive Functions, Hyers-Ulam Stability.

On discontinuous groups acting on solvable homogeneous spaces.

Imed Kédim

Let G be a Lie group, H a closed subgroup of G and Γ a discrete subgroup of G. If the action of Γ on G/H is discontinuous, we consider the parameter space

$$R(\Gamma, G, H) := \left\{ \varphi \in \mathrm{Hom}(\Gamma, G) \;\middle|\; \begin{array}{l} \varphi \text{ is injective and } \varphi(\Gamma) \\ \text{is a discontinuous subgroup for } G/H \end{array} \right\}.$$

The action of G on $\mathrm{Hom}(\Gamma, G)$ by composition on the left of the inner automorphisms leaves the parameter space invariant. The deformation space is the quotient space

$$\tau(\Gamma, G, H) = R(\Gamma, G, H)/G.$$

There are many natural questions about the structure and the topological and geometric features of $\tau(\Gamma, G, H)$. In this lecture, we present some recent developments, focusing on Hausdorffness, stability and rigidity problems in the context of some Lie groups.

Hamiltonians for polynomial potentials and representations of nilpotent groups.

Khalid Koufany

Let H be a Hamiltonians of polynomial potential. We associate to H a nilpotent group G, and consider a unitary representation π of G induced from a subgroup $K \leq G$ such that $H = \pi(D)$ where D is a left-invariant differential operator. The representation π can be decomposed in a direct sum of irreducibles, $\pi = \int^{\oplus} \pi_\lambda d\mu(\lambda)$. The analysis of the operators $\pi_\lambda(D)$ gives solutions of the Shrodinger equation $-Hu = \partial u/\partial t$. Our talk will mainly focus on the quartic and the Hénon-Heiles Hamiltonians.

The group algebra $L^1(G)$.

Jean Ludwig

The multiplication in a locally compact group G with Haar measure dx determines the convolution product in the involutive Banach algebra $L^1(G) = L^1(G, dx)$ and this algebra determines also the group G up to isomorphism. The structure of this algebra is mostly unknown. We recall some properties of this algebra, properties which have been discovered during the last 50 years.

Twistings of algebra and bialgebra structures.

Abdenacer Makhlouf

In the last years, many concepts and properties from classical algebraic theories have been extended to the framework of Hom-structures. In this talk,we deal with a recent generalization involving two linear maps. We mainly discuss constructions and representations of BiHom-associative algebras, BiHom-Lie algebras and BiHom-bialgebras, as well as some constructions of twisted tensor products and smash products.

Transfer group for renormalized multiple zeta values.

Dominique Manchon

How to extend multiple zeta values to integer arguments of any sign such that the quasi-shuffle relations are still verified? We will show that the set of solutions to this problem is nonempty, and is a principal homogeneous space under the left action of a pro-unipotent group. Joint work with K. Ebrahimi-Fard, J. Singer and J. Zhao.

An Integral Expression for the Dunkl Kernel in the Dihedral Setting.

Mostafa Maslouhi

We establish an integral expression for the Dunkl kernel in the context of Dihedral group of an arbitrary order. As a consequence, an explicit expression of the Dunkl kernel $E_k(x, y)$ is given when one of its argument x or y is invariant under the action of a known reflection in the Dihedral group. We obtain also a generating series for the homogeneous components $E_m(x, y)$, $m \in \mathbb{Z}^+$, of the Dunkl kernel from which we derive new sharp estimates for the Dunkl kernel when the parameter function k satisfies $mrRe(k) > -\nu$, ν an arbitrary nonnegative integer.

Matrix-valued commuting family of differential operators associated with symmetric spaces.

Shimeno Nobukazu

I present commuting family of matrix-valued differential operators whose coefficients are given by elliptic functions. These operators are generalization of radial parts of invariant differential operators on certain homogeneous vector bundles on Riemannian symmetric spaces of rank two. I also discuss about eigenfunctions.

Ideals in $\mathcal{L}^1(G)$ associated with compact orbits in the unitary dual of a nilpotent Lie group G.

Detlev Poguntke

For each closed ideal I in $\mathcal{L}^1(A)$, A a locally compact abelian group, one may consider, as an invariant, its hull $h(I)$ in the Pontryagin dual $A^\wedge$. A closed subset Ω of $A^\wedge$ is called a set of synthesis if there is exactly one ideal whose hull is Ω. Besides several positive results it turned out that even spheres in $\mathbb{R}^n$ are not sets of synthesis for $n \geq 3$ (L. Schwartz, N. Varopoulos). With each closed subset of $A^\wedge$ one can associate a largest ideal whose hull is Ω, namely the kernel $k(\Omega)$, and also a smallest ideal, say $j(\Omega)$, whose hull is Ω. The quotient $k(\Omega)/j(\Omega)$ "measures the distance" from being a set of synthesis. For spheres this quotient is nilpotent, there is $m \in \mathbb{N}$ with $[k(S^{n-1})/j(S^{n-1})]^m = 0$.

Some 30 years ago the interest in this circle of questions seemed to decline, but it was revitalized by Jean Ludwig in a non-commutative context, in particular for a simply connected nilpotent Lie group G. Replacing the Pontryagin dual by the unitary dual $G^\wedge$ one may as well associate with each closed subset Ω of $G^\wedge$ the kernel $k(\Omega)$ which is the largest ideal with hull Ω. Using Dixmier's functional calculus J. Ludwig established also the existence of a smallest ideal $j(\Omega)$.

Even a singleton is a set of synthesis only very rarely, but J. Ludwig could show that $k(\Omega)/j(\Omega)$ is nilpotent in this situation. It is the purpose of this talk to contribute such claims in case of orbits under a compact group, or even a semidirect product of a compact group with a unipotent group.

On the Chabauty space of a locally compact group.

Firas Sadki

Let G be a locally compact group. We denote by $\mathrm{Sub}(G)$ the hyperspace of closed subgroups of G endowed with the Chabauty topology. In this talk we study the continuity of the following map

$$\mathrm{Cent}_G \colon G \longrightarrow \mathrm{Sub}(G); \quad g \longmapsto \mathrm{Cent}_G(g);$$

where $\mathrm{Cent}_G(g)$ is the centralizer of g in G.

Admissible representations, multiplicity-free representations, and visible actions on non-tube type Hermitian symmetric spaces.

Atsumu Sasaki

In this talk, we give a new characterization for a non-compact Hermitian symmetric space to be of tube type (or non-tube type) by multiplicities in some branching laws and visible actions. Further, we give an example of a kind of the Cartan decomposition for non-symmetric homogeneous spaces.

Cohomology of $\mathfrak{sl}(2)$ acting on the space of n-ary differential operators on $\mathbb{R}$.

Rabeb Sidaoui

We compute the cohomological space $H^1_{diff}(\mathfrak{sl}(2), D_{\lambda,\mu})$ where $\mu \in \mathbb{R},\ \lambda = (\lambda_1, \dots, \lambda_n) \in \mathbb{R}^n$ and $D_{\lambda,\mu}$ is the space of multilinear differential operators from $\mathcal{F}_{\lambda_1} \otimes \dots \otimes \mathcal{F}_{\lambda_n}$ to $\mathcal{F}_\mu$. The structure of these spaces was conjectured in [M. Ben Ammar et al. in International Journal of Geometric Methods in Modern Physics Vol. 9, No. 4 (2012) 1250033 (15 pages).]
Keywords: Cohomology, Weighted Densities.

Trajectories of Quadratic Differentials for Generalized Laguerre and Jacobi Polynomials.

Faouzi Thabet

The motivation of this lecture is the large-degree analysis of the behavior of the Laguerre $(L_n^{\alpha_n})$ and Jacobi $\left(P_n^{\alpha_n,\beta_n}\right)$ polynomials, when the parameters are complex and depend on the degree n linearly. We show that the Cauchy transforms of the limits (weak) of the roots-counting measures of these polynomials satisfy quadratic algebraic equations of the form : $p(z)\,\mathcal{C}^2(z)+q(z)\mathcal{C}(z)+r=0$, with $\deg p = 1, 2$, $\deg q = 1$, and $r \in \mathbb{C}^*$. We investigate the existence of solution of these equations as Cauchy transform of compactly supported positive measures. Any connected curve of the support of these measures (if exist) coincides with a horizontal trajectory of some quadratic differential. In this lecture, we discuss the trajectories of a family of quadratic differentials, and we emphasize the connection with the distribution of zeros of generalized Laguerre & Jacobi polynomials.

Keywords : Orthogonal polynomials. Cauchy transform of a Borelian measure. Quadratic differentials. Trajectories and orthogonal trajectories of a quadratic differential. Homotopy classes.

Vertical and horizontal rigidity.

Taro Yoshino

Ali Baklouti conjectured that no Clifford-Klein form $\Gamma\backslash G/H$ is locally rigit if G is a 1-connected nilpotent Lie group and H is a closed subgroup. In this talk we introduce the concept of vertical rigidity and horizontal rigidity. Here, one can easily check that a Clifford-Klein form is locally rigid if and only if it is vertical and horizontally rigid