Centre International de Rencontres Mathématiques (CIRM)

Rapport scientifique

Chaire "Pays du Sud", CIRM 2026

Representation Theory and Analysis on Homogeneous Spaces

Théorie des représentations et analyse sur les espaces homogènes

Recherche en Résidence, École thématique et Workshop

1er septembre – 30 octobre 2026

par

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Septembre – Octobre 2026

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1 La Chaire Pays du Sud 2026

La Chaire Pays du Sud 2026, intitulée « Théorie des représentations et analyse sur les espaces homogènes », s'est tenue au Centre International de Rencontres Mathématiques (CIRM) de Marseille du 1er septembre au 30 octobre 2026. Placée sous la direction d'Ali Baklouti (Université de Sfax, directeur du laboratoire LAMHA) et la co-direction de Michael Pevzner (Université de Reims Champagne-Ardenne, responsable du Laboratoire franco-japonais FJ-LMI), elle eu pour vocation de soutenir la recherche mathématique dans les pays du Sud et de favoriser la participation de jeunes chercheurs à des échanges scientifiques internationaux de haut niveau. Elle s'est articulée autour de quatre temps forts : deux séjours de recherche (*Research in Residence*), une école thématique et un workshop international.

1.1 Cérémonie d'ouverture et remerciements

L'ouverture officielle de la « Chaire Pays du Sud 2026 » en Mathématiques a eu lieu le 26 septembre 2026 à 10 h, au CIRM. Cette cérémonie, à la fois sobre et chaleureuse, s'est déroulée dans une ambiance particulièrement agréable, en présence de Son Excellence Monsieur Mohamed Chargui, Consul Général de Tunisie à Marseille, dont la présence et le précieux soutien ont été vivement appréciés. Elle a réuni, aux côtés de nombreux collègues et partenaires scientifiques, Prof. Pascal Hubert, directeur du CIRM, ainsi que Prof. Stephan Enoch, Vice-Président Recherche d'Aix-Marseille Université.

La cérémonie a été ouverte par les mots de bienvenue de Pascal Hubert, Ali Baklouti et Michael Pevzner (en ligne depuis Tokyo), qui ont rappelé les objectifs de la Chaire : soutenir la recherche mathématique dans les pays du Sud et encourager les échanges scientifiques entre la Tunisie, la France, l'Afrique et le reste du monde. Chacun des participants, présents au CIRM ou connectés à distance, a ensuite pris la parole pour exprimer son soutien et ses encouragements.

Plusieurs institutions tunisiennes ont tenu à s'associer à cet événement par une participation en ligne : le Président de l'Université de Sfax, la Présidente de l'Académie Tunisienne des Sciences, des Lettres et des Arts – Beit al-Hikma, le Directeur du Département des Sciences de l'Académie, le Président et le Président honoraire du MIMS (*Mediterranean Institute of Mathematical Sciences*), ainsi que le Président de la Société Mathématique de Tunisie. Leur présence, comme celle des intervenants sur place, témoigne de l'importance accordée à cette initiative et de la volonté commune de renforcer les liens et les collaborations scientifiques entre la Tunisie, la France, l'Afrique et les pays du Sud.

Ce fut un moment touchant, empreint d'émotion et de fierté pour la Tunisie. Que toutes celles et tous ceux qui ont pris part à cette cérémonie, sur place ou à distance, soient chaleureusement remerciés pour leur présence, leur soutien et leur engagement en faveur des mathématiques et de la coopération scientifique internationale.







Cérémonie d'ouverture de la Chaire Pays du Sud 2026, CIRM, 26 septembre 2026.

2 Research in Residence 1

Analyse, représentations et géométrie sur les espaces homogènes
Analysis, Representations, and Geometry on Homogeneous Spaces
Dates : 7 – 18 septembre 2026.

2.1 Participants

— M. Ali Baklouti (Université de Sfax)
— Mme Junko Inoue (Université de Tottori)

2.2 Résumé du travail réalisé

Le but principal de cette activité était la rédaction de l'article *« Sur la norme de la transformée de Fourier L^p pour les groupes de Lie presque nilpotents »*.

Objectif. Il s'agit d'estimer la norme de la transformée de Fourier L^p pour les groupes semi-directs $G = N \rtimes H$ de type I, avec un intérêt particulier sur le cas $G = N \rtimes \mathbb{R}$, des participants N est un groupe nilpotent simplement connexe. L'article prolonge des travaux antérieurs sur les extensions compactes de groupes localement compacts.

Outils utilisés.

- la description de Mackey du dual unitaire (orbites de H dans $\widehat{N}$ et groupes stabilisateurs $H_{[\pi]}$) ;
- la méthode des orbites de Kirillov–Pukánszky ;
- les densités de Plancherel données par le pfaffien pour les groupes nilpotents ;
- le formalisme de Duflo–Moore dans le cas non unimodulaire.

Cadre. Soit $G = N \rtimes_\alpha \mathbb{R}$ avec $\alpha_t = \exp(tD)$, d'algèbre de Lie $\mathfrak{g} = \mathfrak{n} \rtimes_D \mathbb{R}A$ où $[A, X] = DX$. Pour $\ell \in \mathfrak{n}^*$, la forme alternée $B_\ell(X, Y) = \ell([X, Y])$ gouverne l'orbite coadjointe de ℓ. La représentation associée à une polarisation de Pukánszky $\mathfrak{p}_\ell$ est

$$\pi_\ell = \operatorname{Ind}_{P_\ell}^{N} \chi_\ell, \qquad \chi_\ell(\exp X) = e^{i\ell(X)}.$$

Mesure de Plancherel de N. Sur une section transverse V convenable de $\mathfrak{n}^*$,

$$d\mu_N(\pi_\ell) = c_N \,|\operatorname{Pf}(\ell)|\, d\ell,$$

où c_N dépend de la mesure de Haar et de la normalisation de Fourier. C'est ici qu'intervient le pfaffien.

Dual unitaire de G. Sous les hypothèses de régularité de Mackey et si l'obstruction de Mackey est triviale, les représentations irréductibles sont

$$\Pi_{\ell,\sigma} = \operatorname{Ind}_{N\rtimes\mathbb{R}_{[\ell]}}^{G}(\pi_\ell \otimes \sigma), \qquad \mathbb{R}_{[\ell]} = \{t \in \mathbb{R} : \pi_{t\cdot\ell} \simeq \pi_\ell\}.$$

Trois cas se présentent : $\mathbb{R}_{[\ell]} = \{0\}$ (pas de paramètre σ), $\mathbb{R}_{[\ell]} = a\mathbb{Z}$ (un paramètre entier supplémentaire, car le dual est $\mathbb{T}$), et $\mathbb{R}_{[\ell]} = \mathbb{R}$ (représentation invariante, qui forme un ensemble de mesure de Plancherel nulle).

Résultat principal (formulation de travail). Si G est unimodulaire,

$$\|f\|_2^2 = \int_{V/\mathbb{R}} \int_{\widehat{\mathbb{R}_{[\ell]}}} \|\Pi_{\ell,\sigma}(f)\|_{\mathrm{HS}}^2 \, d\nu_{[\ell]}(\sigma)\, d\bar{\mu}([\ell]),$$

où $\bar{\mu}$ est la désintégration de la mesure $c_N|\operatorname{Pf}(\ell)|\,d\ell$ le long de l'action de $\mathbb{R}$. Si G n'est pas unimodulaire, elle est corrigée par les opérateurs de Duflo–Moore D_Π :

$$\|f\|_2^2 = \int_{\widehat{G}} \|\Pi(f) D_\Pi^{1/2}\|_{\mathrm{HS}}^2 \, d\mu_{\mathrm{Pl}}(\Pi).$$

Le groupe G est unimodulaire si et seulement si $\operatorname{tr} D = 0$.

Exemple : le cas presque abélien. Pour $N = \mathbb{R}^n$ et $G = \mathbb{R}^n \rtimes_A \mathbb{R}$, le pfaffien est trivial ($\operatorname{Pf}(\xi) = 1$) et la densité de Plancherel se réduit à la mesure de Lebesgue. Le noyau scalaire est

$$K_\xi(s, r) = \widehat{f}\big(s - r,\, e^{-sA^T}\xi\big).$$

La discussion selon le spectre de A donne : parties hyperbolique, elliptique et nulle ; si A n'a que des valeurs propres imaginaires pures, G est unimodulaire, mais des blocs de Jordan peuvent produire une croissance polynomiale, et des fréquences rationnellement indépendantes peuvent donner des orbites denses dans un tore, ce qui peut détruire la propriété de type I.

2.3 Participants

— Ali Baklouti (Université de Sfax)

— Toshiyuki Kobayashi (Université de Tokyo)

Ali Baklouti a discuté le nouveau projet de recherche concernant la caractérisation des actions fortement visibles sur les espaces homogènes complexes des groupes de déplacements euclidiens.

Une nouvelle thèse est en cours en relation avec ce thème de recherche. L'étudiant Hassen Bourokba a présenté ses premiers résultats lors de l'école de recherche qui s'est tenue au CIRM durant la semaine du 21 au 25 septembre 2026.

3 École thématique (Thematic School)

Théorie des représentations, géométrie et quantification sur les espaces homogènes

Representation Theory, Geometry, and Quantization on Homogeneous Spaces

Dates : 21 – 25 septembre 2026.

L'école thématique, organisée dans le cadre des activités de la Chaire Pays du Sud 2026 au CIRM, a débuté le lundi 21 septembre 2026 et s'est tenue jusqu'au vendredi 25 septembre. Elle a réuni des experts de renommée internationale autour de quatre cours avancés : Fanny Kassel *actions propres sur les espaces homogènes réductifs*, Toshiyuki Kobayashi *analyse spectrale sur les espaces localement symétriques*, Dominique Manchon *quantification par déformation et représentations* et Angela Pasquale *correspondance de Howe sur les réels*. Destinée aux doctorants, post-doctorants et jeunes chercheurs, en particulier ceux issus des pays du Sud, l'école offrait une introduction à la fois accessible et substantielle à l'interaction entre l'algèbre, la géométrie et l'analyse, avec un accent marqué sur les notions fondamentales comme sur les développements récents. Le programme détaillé et les résumés des exposés figurent en Annexe A.



Photo de groupe de l'école de recherche.

4 Workshop

Théorie des représentations et analyse harmonique sur les espaces homogènes
Representation Theory and Harmonic Analysis on Homogeneous Spaces
Dates : 28 septembre – 2 octobre 2026.

Ce workshop international a débuté le lundi 28 septembre 2026 et s'est tenu jusqu'au vendredi 2 octobre. Dans le prolongement des thèmes introduits lors de l'école thématique qui l'avait précédé, il a rassemblé des spécialistes de premier plan et de jeunes chercheurs autour des avancées récentes en théorie des représentations et en analyse harmonique sur les espaces homogènes, aux confluents de la théorie de Lie, de l'analyse géométrique, de la quantification et de la géométrie différentielle, avec une attention particulière portée aux orbites coadjointes, à la théorie spectrale, aux actions propres de groupes, aux dualités et à la quantification par déformation. Alternant exposés pléniers, sessions thématiques et échanges informels, il visait à renforcer les collaborations existantes et à stimuler de nouvelles directions de recherche, tout en soutenant la participation de jeunes mathématiciens prometteurs des pays du Sud. Le programme détaillé et les résumés des exposés figurent en Annexe B.



Photo de groupe du workshop.

5 Research in Residence 2

Algèbres d'opérateurs et analyse géométrique non commutative
Operator Algebras and Noncommutative Geometric Analysis
Dates : 19 – 30 octobre 2026.

5.1 Participants

— Lobna Abdelmoula (Université de Sfax)

— Ali Baklouti (Université de Sfax)

— Toshiyuki Kobayashi (Université de Tokyo)

— Michael Pevzner (Université de Reims)

Cette activité, organisée dans le cadre du programme *Research in Pairs* au CIRM, a réuni Michael Pevzner (Reims), Ali Baklouti (Sfax), Lobna Abdelmoula (Sfax) et Toshiyuki Kobayashi (Tokyo).
Ali Baklouti et Lobna Abdelmoula ont développé l'étude des applications moment et de leurs liens profonds avec la théorie des représentations et la géométrie symplectique. La collaboration a permis d'analyser les structures géométriques et algébriques sous-jacentes aux ensembles de moments associés aux représentations unitaires, en particulier dans le contexte des groupes de Lie nilpotents et résolubles. En combinant des techniques issues de la quantification par déformation, de la théorie des invariants et de la géométrie des orbites, les chercheurs ont approfondi la compréhension du rôle des applications moment dans la méthode des orbites et examiné leurs implications pour la classification des représentations. La diversité et la complémentarité des compétences des participants, issus à la fois des pays du Sud et d'institutions internationales, a enrichi les approches scientifiques et contribué pleinement aux objectifs de collaboration, de partage des connaissances et de renforcement de la recherche mathématique promus par la Chaire Pays du Sud.

5.2 Projet d'ouvrage : *Dequantization : Moment Sets and Characteristic Varieties*

Parallèlement à ces travaux, Lobna Abdelmoula et Ali Baklouti ont mis à profit cette période pour lancer la préparation d'un livre intitulé *Dequantization : Moment Sets and Characteristic Varieties*, consacré à la quantification et à la déquantification pour les groupes de Lie nilpotents et résolubles. L'ouvrage est organisé en sept chapitres. Il débute par un rappel de la théorie des représentations des groupes de Lie résolubles (chapitre 1), puis introduit les applications moment et les ensembles de moments (chapitre 2). Il développe ensuite la notion d'applications moment généralisées, d'abord dans les cadres nilpotent, exponentiel et résoluble, avec notamment l'étude des groupes $E(2)$ et $\mathbb{R} \ltimes \mathbb{R}^d$ et un théorème de séparabilité pour les groupes de Lie résolubles de type 1 (chapitre 3), puis celle d'applications moment complètes, pour les groupes de Lie connexes généralisés comme pour les espaces de Hilbert non séparables, avec l'exemple du groupe de Mautner (chapitre 4). Le chapitre 5 traite de la séparation des représentations au moyen de sur-groupes : construction de sur-groupes pour les groupes exponentiels, sur-groupes quadratiques pour les groupes de Lie spéciaux et pour les groupes de Lie "diamant" puis "diamant généralisés", groupes résolubles de petite dimension, et exemples non résolubles tels que $SL(2,\mathbb{R})$ et $SO(4) \ltimes \mathbb{R}^4$. Le chapitre 6 est consacré à une version faible de cette séparation, pour les groupes de Lie résolubles de type 1 de la forme $\mathbb{R} \ltimes \mathbb{R}^n$ et pour les sur-groupes quadratiques faibles des groupes de Lie spéciaux généralisés, avec des applications aux groupes nilpotents de petite dimension. Le livre s'achève par un chapitre sur la déquantification au moyen des variétés caractéristiques (chapitre 7). Ce projet, qui n'en est qu'à ses débuts, prolonge de manière naturelle les thèmes de la Chaire Pays du Sud.

5.3 Recherche en résidence

Participants

— Toshiyuki Kobayashi (Université de Tokyo)

— Michael Pevzner (Université de Reims)

T.Kobayashi et M.Pevzner ont poursuivi leurs travaux sur les opérateurs SBO (symmetry breaking operators). Ils ont notamment établi une correspondance bijective entre les SBO

agissant sur des fibrés vectoriels équivariants au-dessus d'espaces homogènes et certains homomorphismes entre représentations de deux algèbres de Lie. Leur approche, connue sous le nom de F-method, repose sur une transformée de Fourier algébrique appliquée aux modules de Verma généralisés. Elle permet de caractériser ces opérateurs au moyen de systèmes d'équations aux dérivées partielles, offrant ainsi un cadre algébrique et analytique pour leur construction et leur classification. Les SBO sont des opérateurs équivariants remarquables dont le noyau distributionnel encode des propriétés fines de la géométrie des variétés de drapeaux. La structure des stratifications de ces variétés a été étudiée en lien avec les lois de branchement des représentations de dimension infinie de plusieurs séries de groupes de Lie réductifs.

6 Publication des actes (Proceedings du CIRM)

Il a été prévu de publier les actes de l'école et du workshop avec le concours de Centre Mersenne de l'UAR 5638 du CNRS. L'acceptation des contributions sera basée sur un processus d'évaluation externe standard. Des invitations personnalisées seront envoyées aux conférenciers rapidement et des contributions seront retenues après expertise (évaluation par des experts), et leurs auteurs seront invités à rédiger un article destiné à ce volume. Seuls les articles ayant satisfait à cette procédure d'expertise seront publiés dans les Proceedings de la chaire pays du sud.

7 Contribution financière de la Tunisie à l'organisation de la chaire

Les participants suivants ont pu bénéficier d'un séjour au CIRM ; leurs frais de visa et de transport ont été pris en charge par le financement local.

Nom et prénom	**Type de séjour**	**Montant (€)**
Abdelmoula Lobna	Recherche en résidence	596,64
Agrebaoui Boujemaa	Workshop (sans visa)	477,44
Alaya Nejeh	École de recherche	312,58
Azaouzi Salma	Workshop	596,64
Ben Soula Yesmine	École de recherche	596,64
Dali Béchir	Workshop	596,64
Elaloui Nasreddine	École de recherche	596,64
Khalfi Rafik	École de recherche	596,64
Maalaoui Mohamed Ali	École de recherche	596,64
Rahali Aymen	Workshop (sans visa)	477,44
Sayari Chayma	École de recherche	596,64

Remarque : Plusieurs participants japonais ont financé leur participation sur leurs fonds propres.

8 Problèmes rencontrés dans le cadre de la Chaire Pays du Sud

Parmi les difficultés rencontrées au cours de la Chaire, le problème des visas a été de loin le plus sérieux, et il mérite d'être signalé avec insistance. L'organisation d'une école et d'un workshop repose sur un travail long et minutieux : élaboration du programme scientifique, invitation de conférenciers et d'enseignants, sélection de doctorants et de jeunes chercheurs, en particulier ceux issus des pays du Sud, et engagement de chacun à donner un cours ou un exposé à une date précise. Lorsque, une fois ce programme arrêté, des participants se voient refuser

leur visa, ce sont à la fois l'équilibre scientifique des sessions et l'un des objectifs essentiels de la Chaire, à savoir le soutien aux chercheurs africains, qui se trouvent directement compromis.

Au total, neuf participants invités ont essuyé un refus de visa : quatre Tunisiens, dont un professeur, deux Algériens, deux Burundais dont le président de la Société mathématique du Burundi, et un Ghanéen. Ces refus sont d'autant plus difficiles à accepter qu'ils sont intervenus après l'envoi des invitations officielles et alors que les exposés de ces collègues étaient déjà inscrits au programme. Il a fallu réorganiser des sessions dans l'urgence, modifier l'ordre des interventions et, dans plusieurs cas, renoncer à la présence physique de chercheurs dont la contribution était pourtant prévue de longue date. Pour les jeunes chercheurs concernés, la perte est aussi personnelle : une occasion rare de présenter leurs travaux, de rencontrer des spécialistes internationaux et de nouer des collaborations leur a été retirée.

À ces refus s'ajoute une difficulté en amont, tout aussi pénalisante : l'impossibilité, pour de nombreux candidats, d'obtenir un rendez-vous pour déposer leur demande de visa. Faute de créneaux disponibles dans des délais compatibles avec les dates de l'école et du workshop, certains participants n'ont pas pu déposer leur dossier à temps et ont donc été exclus avant même qu'une décision ne soit prise. Cette situation est particulièrement préoccupante pour les rencontres scientifiques, dont les dates sont fixées longtemps à l'avance et ne peuvent être reportées au gré des disponibilités des services consulaires et leurs intermédiaires.

Ces obstacles touchent de manière disproportionnée les chercheurs des pays du Sud, c'est-à-dire précisément le public que la Chaire cherchait à soutenir. Ils fragilisent la dimension internationale des rencontres, appauvrissent les échanges scientifiques et risquent de décourager durablement de jeunes mathématiciens africains de s'engager dans des collaborations avec des partenaires européens.. Il nous semble donc essentiel que ce problème soit pris en compte lors de la préparation de futures éditions, par exemple par un envoi des invitations le plus tôt possible, un accompagnement renforcé des participants dans leurs démarches, ou encore des démarches coordonnées auprès des autorités compétentes afin de faciliter l'accès aux rendez-vous et le traitement des demandes. Nous tenons à souligner que, sans une amélioration de ces conditions, l'objectif d'une véritable ouverture de la communauté mathématique internationale aux chercheurs du Sud restera difficile à atteindre pleinement.

Annexes

Annexe A : École thématique : programme et résumés des exposés

Annexe B : Workshop : programme et résumés des exposés

Annexe A – École thématique, 21 – 25 septembre 2026

Programme et titres des exposés

Lundi 21 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–10h00	T. Kobayashi (Tokyo)	Spectral analysis on locally symmetric spaces
10h00–10h30	*Pause café*	
10h30–12h00	F. Kassel (IHES)	Proper actions on reductive homogeneous spaces
12h00–12h30	S. Miyauchi (Tokyo)	Classification of connected proper pairs in the affine transformation group
12h30–14h30	*Déjeuner*	
14h30–16h00	A. Pasquale (Metz)	The Howe correspondence over the reals
16h00–16h30	*Pause café*	
16h30–17h00	I. Ghanimi* (Kenitra)	Characterization of the L^p range of a generalized Poisson transform of the quaternionic unit ball
17h00–17h30	O. Oyadare* (Nigeria)	Fourier and Helgason Fourier transforms for Vector Bundle-valued Differential Forms on Homogeneous Spaces

Mardi 22 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–10h00	D. Manchon (Clermont)	Deformation quantization and representations
10h00–10h30	*Pause café*	
10h30–11h00	A. G. D. Atindehou (Bénin)	Towards a Characterization of the Gabor Frame Set for Compactly Supported Continuous Functions
11h00–11h30	A. Y. Kraidi (Abidjan)	On some properties of Reproducing Kernel Hilbert modules
11h30–12h00	C. Khoule (Dakar)	Structure de l'Espace des Origines Affines d'une Structure de Contact
12h00–12h30	R. Nakahama (Tokyo)	Characterization of infinite-order differential holographic operators for symmetric pairs of holomorphic type by differential equations
12h30–14h30	*Déjeuner*	
14h30–15h30	T. Kobayashi (Tokyo)	Spectral analysis on locally symmetric spaces
15h30–16h00	S. Liang (Orsay)	Tempered homogeneous spaces
16h00–16h30	*Pause café*	
16h30–17h00	L. Wolf (IHES)	Tempered locally symmetric spaces via Poincaré series
17h00–17h30		*Discussions et exercices*

Mercredi 23 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h30	A. Pasquale (Metz)	The Howe correspondence over the reals
09h30–10h00	C. Sayari (Bizerte)	Cortex of Lie algebras in particular cases

Horaire	Orateur	Titre de l'exposé
10h00–10h30	*Pause café*	
10h30–11h30	F. Kassel (IHES)	Proper actions on reductive homogeneous spaces
11h30–12h00	H. Bourokba (Sfax)	Visible actions on complex domains related to Euclidean motion groups
12h00–12h30	K. Abid (Sfax)	Uncertainty Principles for the Gabor Transform on Certain Lie Groups
12h30–14h30	*Déjeuner*	
après-midi	*Après-midi libre*	

Jeudi 24 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h30	G. Ngambali Ndzakima (Brazzaville)	Polarisations and Irreducibility of Induced Representations of Nilpotent Lie Groups
09h30–10h00	V. Massicot (Reims)	Symmetry Breaking Operators for $(GL(3,\mathbb{R}), GL(2,\mathbb{R}))$
10h00–10h30	*Pause café*	
10h30–12h00	D. Manchon (Clermont)	Deformation quantization and representations
12h00–12h30	J. Ditlevsen (Tokyo)	Branching laws for Stein's complementary series and Speh representations
12h30–14h30	*Déjeuner*	
14h30–16h00	A. Pasquale (Metz)	The Howe correspondence over the reals
16h00–16h30	*Pause café*	
16h30–17h00	I. Ben Chenni (Monastir)	Autour de la topologie duale de certains groupes de Lie à nilradical co-compact
17h00–17h30	J. Gonessa (Bangui)	Estimations L^p–L^q des opérateurs de type Forelli–Rudin dans la boule minimale

Vendredi 25 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h30	D. Manchon (Clermont)	Deformation quantization and representations
09h30–10h00	Y. Ben Soula (Bizerte)	Lattices in the Metabelian Nilpotent Lie Group
10h00–10h30	*Pause café*	
10h30–12h00	F. Kassel (IHES)	Proper actions on reductive homogeneous spaces
12h00–12h30	T. Hikawa (Tokyo)	The Schwartz Space for the (k,a)-Generalized Fourier Transform and the Minimal Representation of the Conformal Group
12h30–14h30	*Déjeuner*	
14h30–16h00	T. Kobayashi (Tokyo)	Spectral analysis on locally symmetric spaces
16h00–16h30	*Pause café*	
16h30–17h00	R. Khalfi (Bizerte)	The Benson–Ratcliff invariant of MD-algebras and central extensions of nilpotent Lie algebras
17h00–17h30		*Discussions et exercices*

** : exposé en ligne.*

Résumés des exposés

Cours

Angela Pasquale (Metz)

Title: The Howe correspondence over the reals

Abstract: The Howe correspondence, also called theta correspondence, is one of the cornerstones of the modern Representation Theory over local and finite fields, with important applications in Harmonic Analysis, Number Theory and Quantum Mechanics. In these lectures, we will be concerned with the Howe correspondence over the field of real numbers. After constructing the metaplectic group, that is the unique connected double covering group of the symplectic group, we will define the Weil representation (aka as Segal-Shale-Weil or oscillatory representation) in its Schrödinger and Fock models, following the explicit approach initiated by Aubert and Przebinda. We then study the Weil representation through its distribution character and matrix coefficients. The Howe correspondence is based on Howe's notion of reductive dual pairs in a symplectic group. We will present their classification and their realization as Lie supergroups. We then introduce Howe's correspondence, first for the special case of dual pairs with a compact member and then in general. Examples will illustrate the general theory.

Dominique Manchon (Clermont)

Title: Deformation quantization and representations

Abstract: These lectures will address some applications of deformation quantization to representation theory, focusing on nilpotent and solvable Lie groups. Prerequisites are basics on Lie groups and Lie algebras, as well as elementary notions of differential geometry.

1. Poisson algebras, Poisson manifolds, deformation quantization.
2. A brief survey of M. Kontsevich's formality theorem, implying that any Poisson manifold is deformation quantizable.
3. Linear Poisson manifolds. Symplectic leaves and coadjoint orbits.
4. Kirillov orbit method (nilpotent and solvable case). Kirillov and Dixmier maps.
5. Characteristic variety and Poisson characteristic variety.

Fanny Kassel (IHES)

Title: Proper actions on reductive homogeneous spaces

Abstract: Proper actions of discrete groups on homogeneous spaces G/H play an important role in several areas of mathematics, in particular in geometry. If G and H are both noncompact, then not all discrete subgroups of G act properly on G/H, and it is a very difficult problem in general to understand which discrete subgroups of G can reach the delicate balance of being small enough to act properly on G/H, but large enough for the quotient to be interesting, for instance compact. This problem has given rise to a rich literature, at the interface of group theory, Lie theory, representation theory, geometry, topology, and dynamics. We will survey some of the key developments in this area, from the late 1980s to the present. Applications to spectral analysis on pseudo-Riemannian locally symmetric spaces will be presented by T. Kobayashi in the same week.

Toshiyuki Kobayashi (Tokyo)

Title: Spectral analysis on locally symmetric spaces

Abstract: In this series of expository lectures, I will provide an introductory overview of recent advancements in the spectral analysis of locally symmetric spaces, going beyond the traditional Riemannian framework. This topic is built upon the theory of proper action on reductive homogeneous spaces, which will be presented by F. Kassel in the same week, alongside the theory of global analysis on symmetric spaces and a rapidly developing theory of branching in infinite-dimensional representations of reductive groups. My aim is to clarify key concepts in a non-technical manner, using several elementary examples to make the fundamental ideas more accessible.

Sessions jeunes chercheurs

Khouloud Abid (Sfax)

Title: Uncertainty Principles for the Gabor Transform on Certain Lie Groups

Abstract: In this work, we study uncertainty principles for the Gabor transform on non-commutative Lie groups. We establish Heisenberg-type uncertainty inequalities for several classes of nilpotent Lie groups and compact extensions of Rn. We also prove a Hardy-type uncertainty principle on connected simply connected nilpotent Lie groups. These results extend classical uncertainty principles to a non-commutative setting.

Abdou Ganiou Débayo Atindehou (Benin)

Title: Towards a Characterization of the Gabor Frame Set for Compactly Supported Continuous Functions

Abstract:

The determination of the Gabor frame set is a central problem in time–frequency analysis. Although the frame set is known for certain specific classes of window functions, its complete characterization remains largely open, in particular for compactly supported continuous functions.

In this talk, we consider the class $V_{N,a}$ of compactly supported continuous functions, which includes, in particular, the B-splines. We present a matrix-based approach relying on the Ron–Shen duality conditions. By exploiting the compact support of the window and an appropriate partition of the parameter domain, the infinite system arising from the Ron–Shen duality conditions can be reduced to a family of finite matrices $G_m(x)$.

This reduction provides a unified framework for studying the frame property through the invertibility of these matrices.

We recall several previously known results and present new regions in the parameter plane where the matrices $G_m(x)$ are uniformly invertible, thereby yielding new regions of the Gabor frame set for every $g \in V_{N,a}$. We also discuss the construction of alternative compactly supported dual windows associated with these regions.

We then address a more general question : to what extent can the matrices $G_m(x)$ characterize the Gabor frame set ? The positive results obtained so far suggest that the condition

$$\inf_{x\in[-a/2,a/2]} |\det G_m(x)| > 0$$

may play a characterizing role.

Ibtissem Ben Chenni (Monastir)

Title: Autour de la topologie duale de certains groupes de Lie à nilradical co-compact

Abstract:

Ce travail s'inscrit dans l'étude de la théorie des représentations des groupes de Lie compacts ainsi que de la topologie duale de certains groupes de Lie de la forme

$$G = K \ltimes N,$$

où K est un sous-groupe de Lie compact de $\mathrm{Aut}(N)$ et N un groupe de Lie nilpotent connexe et simplement connexe.

La méthode des orbites de Kirillov–Lipsman permet de paramétrer le dual unitaire de certains groupes de Lie G par un objet géométrique, l'espace des orbites coadjointes $\mathfrak{g}^*/G$, où $\mathfrak{g} = \mathrm{Lie}(G)$.

Cette procédure est appelée quantification. L'étude de la convergence des orbites coadjointes admissibles de certains groupes de Lie à nilradical co-compact permet alors de donner une description explicite de la topologie de Fell sur le dual unitaire du groupe considéré.

Yasmin Ben Soula (Bizerte)

Title: Lattices in the Metabelian Nilpotent Lie Group

Abstract:

The main aim of this presentation is the description of a class of lattices in the nilpotent semidirect product group

$$G = \mathbb{R}^n \rtimes_\eta \mathbb{R}^m,$$

where η is the representation of the abelian group $\mathbb{R}^m$ in $GL_n(\mathbb{R})$ given by

$$\eta(t_1, \ldots, t_m) = \exp\left(\sum_{i=1}^{m} t_i N_i\right),$$

with $(N_i)_{1 \leq i \leq m}$ a set of pairwise commuting nilpotent matrices in $M_n(\mathbb{Q})$.

Hassen Bourokba (Sfax)

Title: Visible actions on complex domains related to Euclidean motion groups

Abstract: Recent developments on visible actions for nilpotent Lie groups, particularly in the Heisenberg group case, motivate the study of the geometry of complex actions for the Euclidean motion group $G_n = O_n(\mathbb{R}) \ltimes \mathbb{R}^n$. We first prove that $\mathbb{C}^n$, as a complex homogeneous space, admits no strongly visible action of any compact subgroup of $O_n(\mathbb{R})$. In contrast, the natural action of $O_n(\mathbb{R})$ on the unit sphere in $\mathbb{C}^n$ is strongly visible. We provide a complete characterization of visible (equivalently, strongly visible) actions for semi-direct subgroups of the form $K \ltimes U$, where $K < O_n(\mathbb{R})$ and $U < \mathbb{R}^n$, acting on $\mathbb{C}^n$. Such an action is visible if and only if $U = \mathbb{R}^n$. We extend this classification to nilpotent subgroups of G_n, confirming in all cases that the translational component alone determines visibility.

This is joint work with Ali Baklouti.

Rafik Khalfi (Bizerte)

Title: The Benson-Ratcliff invariant of MD-algebras and central extensions of nilpotent Lie algebras

Abstract: This presentation focuses on the Benson–Ratcliff invariant in the context of central extensions of nilpotent Lie algebras. We successively analyze the abelian, metabelian and r-step cases, then those of Lie algebras with two-dimensional generic coadjoint orbits. We illustrate this result by explicit computation in the case of 6-dimensional nilpotent Lie algebras with 1-dimensional center and identify all counterexamples to the Benson–Ratcliff conjecture in this class. Furthermore, we study this invariant for MD-algebras.

References :

1. Benson, C., Ratcliff, G. : An invariant for unitary representations of nilpotent Lie groups. *Michigan Mathematical Journal* 34(1), 23–30 (1987).
2. Benson, C., Ratcliff, G. : Quantization and an invariant for unitary representations of nilpotent Lie groups. *Illinois Journal of Mathematics* 32(2), 304–322 (1988).
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5. Dali, B., Khalfi, R. : Benson–Ratcliff conjecture on solvable Lie groups. *Communications of the Korean Mathematical Society* 40(2), 333–355 (2025).
6. Khalfi, R. : Benson–Ratcliff invariant and central extensions of nilpotent Lie algebras. *Ricerche di Matematica* (2026).

Cheikh Khoule (Dakar)

Title: Structure de l'Espace des Origines Affines d'une Structure de Contact

Abstract:

Cet exposé explore l'interaction algébrique et géométrique entre les feuilletages (formes intégrables) et les structures de contact (formes maximalement non intégrables).

Nous étudierons l'espace des origines affines $A(\beta)$, constitué des formes de Pfaff intégrables pouvant être déformées vers une forme de contact β par un chemin affine dont les formes intermédiaires restent strictement de contact.

Nous montrerons que l'existence de telles déformations est gouvernée de manière rigide par un invariant géométrique d'interaction $I_\beta(a)$, qui doit être globalement positif ou nul sur toute la variété.

L'exposé s'articulera autour de trois idées principales :

— **Construction analytique :** introduction du chemin de déformation affine et démonstration de la formule exacte décrivant l'évolution du volume de contact.

— **Obstructions topologiques :** étude des contraintes fortes imposées par la condition $I_\beta(a) = 0$, notamment de son lien avec la dynamique du champ de Reeb.

— **Structure algébrique de l'espace :** mise en évidence de la non-linéarité inhérente aux formes intégrables, à travers le défaut d'intégrabilité mutuelle.

Jonathan Ditlevsen (Tokyo)

Title: Branching laws for Stein's complementary series and Speh representations of $GL(2n, \mathbb{R})$

Abstract:

We obtain the explicit direct integral decomposition of Stein's complementary series representations and Speh representations of $GL(2n, \mathbb{R})$ when restricted to the subgroup $GL(2n - 1, \mathbb{R})$.

The main tools for this are two families of symmetry breaking operators between degenerate series representations of $GL(2n, \mathbb{R})$ and $GL(2n - 1, \mathbb{R})$.

Imane Ghanimi (Kenitra)

Title: Characterization of the L^p range of a generalized Poisson transform of the quaternionic unit ball $B(H)$

Abstract:

In this talk, we give a characterization of the L^p-range ($p = 2$) of a generalized Poisson transform P_l on the quaternionic unit ball $B(H)$, associated with an irreducible representation τ_l of $Sp(1)$.

More precisely, since $B(H) = Sp(1)$, if f is a hyperfunction on $Sp(1)$, then, for $\mathrm{Re}(i) > 0$, we prove that

$$f \in L^p(Sp(1)), \qquad p = 2,$$

if and only if its generalized Poisson transform $P_l(f)$ satisfies a Hardy-type growth condition.

Jocelyn Gonessa (Bangui)

Title: Estimations L^p-L^q des opérateurs de type Forelli-Rudin dans la boule minimale

Abstract:

Nous donnons les conditions sur p et q pour que des opérateurs de type Forelli-Rudin dans la boule minimale soient bornés de L^p dans L^q.

Tatsuro Hikawa (Tokyo)

Title: The Schwartz Space for the (k, a)-Generalized Fourier Transform and the Minimal Representation of the Conformal Group

Abstract:

This talk discusses an analog of the classical Schwartz space $\mathcal{S}(\mathbb{R}^N)$ in the framework of (k, a)-deformed harmonic analysis associated with the (k, a)-generalized Fourier transform $\mathcal{F}_{k,a}$.

Motivated by the observation that $\mathcal{S}(\mathbb{R}^N)$ coincides with the space of smooth vectors for the Segal–Shale–Weil representation, we define the (k, a)-generalized Schwartz space $\mathcal{S}_{k,a}(\mathbb{R}^N)$ as the space of smooth vectors for the unitary representation associated with $\mathcal{F}_{k,a}$.

We will present our recent results on the explicit determination of $\mathcal{S}_{k,a}(\mathbb{R}^N)$.

Anoh Yannick Kraidi (Abidjan)

Title: On some properties of Reproducing Kernel Hilbert C^*-modules

Abstract:

In this talk, we investigate the reproducing kernel theory in the framework of Hilbert C^*-modules and the linear transformation of Hilbert C^*-modules. We give an analogue of the inversion formula and the theorems of approximation in a reproducing kernel space.

Siwei Liang (Orsay)

Title: Tempered homogeneous spaces

Abstract: Following the work of Benoist–Kobayashi, we study the quasi-regular representations $L^2(G/H)$ of semisimple Lie groups. In a joint work with Y. Benoist, we establish a geometric criterion characterizing when such a representation is tempered, extending earlier results of Elstrodt, Patterson, Sullivan, Shalom, Benoist–Kobayashi, Edwards–Oh, and Lutsko–Weich–Wolf in various settings. If time permits, I will also discuss extensions to other locally compact groups.

Valentin Massicot (Reims)

Title: Symmetry Breaking Operators for $(GL(3, \mathbb{R}), GL(2, \mathbb{R}))$

Abstract:

Let $H \subset G$ be a pair of real reductive groups and π an irreducible representation of G. Branching problems consist in understanding how the restriction $\pi|_H$ behaves as a representation of H. One of the central questions in this direction is to explicitly construct and classify corresponding symmetry breaking operators (SBOs), i.e. elements of $\mathrm{Hom}_H(\pi|_H, \tau)$, for given representations τ of H.

This approach advocated by T. Kobayashi in his ABC-program has been carried out in a handful of cases, e.g. for $(G, H) = (O(n+1, 1), O(n, 1))$.

In this work, we construct and classify all symmetry breaking operators between principal series for the pair

$$(G, H) = (GL(3, \mathbb{R}), GL(2, \mathbb{R})).$$

This reveals many interesting phenomena related to sporadic operators, hypergeometric polynomials and multiplicities.

Shunsuke Miyauchi (Tokyo)

Title: Classification of connected proper pairs in the affine transformation group

Abstract:

Consider a pair (L, H) of closed subgroups of a Lie group G. In the theory of transformation groups, it is important to find effective criteria for properness. We say that the pair (L, H) is proper if L acts properly on the homogeneous space G/H ; equivalently, H acts properly on G/L. The pair (L, H) is always proper if either L or H is compact. However, when both L and H are non-compact, determining whether (L, H) is proper becomes much more difficult. The systematic study of this problem was initiated by Kobayashi (1989).

Effective criteria are known in several important cases, for example when G is reductive or when G is a low-step nilpotent Lie group. Discontinuous groups for some affine homogeneous spaces, such as Margulis spacetimes, have also been studied.

In this talk, we consider the problem of determining properness for affine transformation groups. As a first test case, Kobayashi (1990) classified the connected subgroups L acting properly on

$$(GL(2, \mathbb{R}) \ltimes \mathbb{R}^2)/GL(2, \mathbb{R}) \simeq \mathbb{R}^2.$$

We give a classification of all connected proper pairs (L, H) in the affine transformation group

$$G = GL(2, \mathbb{R}) \ltimes \mathbb{R}^2.$$

Ryosuke Nakahama (Tokyo)

Title: Characterization of infinite-order differential holographic operators for symmetric pairs of holomorphic type by differential equations

Abstract:

Let (G, G_1) be a symmetric pair of holomorphic type, and we consider the space $\mathcal{O}(D, V)$ of vector-valued holomorphic functions on the bounded symmetric domain $D \simeq G/K$.

Then its restriction to the subgroup G_1 is generically decomposed into a direct sum of subrepresentations $\mathcal{O}(D_1, W)$ of G_1, and there exist G_1-intertwining operators between $\mathcal{O}(D, V)$ and $\mathcal{O}(D_1, W)$.

It is proved by Kobayashi–Pevzner (2016) that the intertwining operators from $\mathcal{O}(D, V)$ to $\mathcal{O}(D_1, W)$ are always given by differential operators, and their symbols are characterized as solutions of certain differential equations.

In this talk, we present a result that the intertwining operators in the opposite direction, called holographic operators, are given by infinite-order differential operators, and their symbols are again characterized as solutions of certain differential equations.

Gael Ngambali Ndzakima (Brazzaville)

Title: Polarisations and Irreducibility of Induced Representations of Nilpotent Lie Groups

Abstract:

Let G be a simply connected nilpotent Lie group and π a finite-dimensional representation of its Lie algebra $\mathfrak{g}$. To each Lie subalgebra $\mathfrak{h}$ subordinate to π, we associate an induced representation $\rho(\pi, \mathfrak{h}, \mathfrak{g})$.

We study the irreducibility of these representations and show, under a condition involving the center of $\mathfrak{g}$ and $\ker \pi$, that $\rho(\pi, \mathfrak{h}, \mathfrak{g})$ is irreducible if and only if $\mathfrak{h}$ is a polarization of π.

Olufemi Oyadare (Nigeria)

Title: Fourier and Helgason Fourier Transforms for Vector Bundle-valued Differential Forms on Homogeneous Spaces

Abstract:

The major aim of studying harmonic analysis on any group or symmetric space is to understand enough of its structure to prove the fundamental theorem via the Fourier transform. We derive the Helgason Fourier transform for vector bundle-valued differential forms on homogeneous spaces and describe its relation to the vector bundle-valued Poisson transform.

We also give explicit formulas for the Fourier and Helgason Fourier transforms and distinguish the cases of invertible and non-invertible vector bundle-valued Poisson transforms.

Chayma Sayari (Bizerte)

Title: Cortex of Lie algebras in particular cases

Abstract:

We investigate the cortex of 7-dimensional Lie algebras in several specific cases.

Lasse Wolf (IHES)

Title: Tempered locally symmetric spaces via Poincaré series

Abstract: We discuss how the temperedness of a large class of locally symmetric spaces can be derived for discrete subgroups Γ where the limit cone $\mathcal{L}_\Gamma$ is contained in the interior of the Weyl chamber. We give an argument that uses the domain of convergence for the Poincaré series which we describe precisely by spectral theory. based on joint work with Chris Lutsko and Tobias Weich.

Annexe B – Workshop, 28 septembre – 2 octobre 2026

Programme et titres des exposés

Lundi 28 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h20	T. Kobayashi (Tokyo)	Hidden Symmetry and Spectral Analysis on Locally Symmetric Spaces beyond the Riemannian Setting
09h30–10h20	A. Makhlouf (Mulhouse)	On restricted Lie triple systems
10h30–11h00	*Pause café*	
11h00–11h50	H. Fujiwara* (Fukuoka)	Monomial representations of type I solvable Lie groups
12h00–12h30	J. Feuto (Abidjan)	Amalgam space on space of homogeneous type and the Hardy–Littlewood maximal operator
12h30–14h30	*Déjeuner*	
14h30–15h20	R. Yuncken (Lorraine)	Harish-Chandra's principle via the Satake groupoid
15h30–16h20	S. Mehdi (Metz)	Representation theoretic symplectic Dirac operators
16h30–17h00	*Pause café*	
17h00–17h30	N. Mahoungou Moukala (Brazzaville)	Représentations d'algèbres de Lie–Rinehart généralisées

Mardi 29 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h20	A. Kumar* (Delhi)	L^p-Gabor transform norm on locally compact groups
09h30–10h20	J. Inoue (Tottori)	Holomorphically induced representations of some nilpotent Lie groups
10h30–11h00	*Pause café*	
11h00–11h50	V. Heiermann (Marseille)	On the determination of unramified spherical special automorphic representations
12h00–12h30	A. Rahali (Monastir)	On Visible Actions in Cartan Motion Groups
12h30–14h30	*Déjeuner*	
14h30–15h20	A. Boussejra (Kenitra)	On the range of generalized spectral projectors on vector bundles over rank one symmetric spaces
15h30–16h20	K. Koufany (Nancy)	Group and multiplication invariant subspaces
16h30–17h00	*Pause café*	
17h00–17h30	A. Nibirantiza* (Burundi)	Geometric quantization of coadjoint superorbits and Schrödinger–Fock representations of the Heisenberg supergroup

Mercredi 30 septembre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h20	S. Thangavelu* (Bengaluru)	A Fourier transform for operators

Horaire	Orateur	Titre de l'exposé
09h30–10h20	S. Azaouzi (Sfax)	Hardy's theorem on compact extensions of Nilpotent Lie Groups
10h30–11h00	*Pause café*	
11h00–11h50	Y. Oshima (Tokyo)	Existence and non-existence of discrete series for homogeneous spaces
12h00–12h30	H. Regeiba* (Gabès)	The C^*-algebras of some Lie groups formed by a semi-direct product
12h30–14h30	*Déjeuner*	
après-midi	*Après-midi libre*	

Jeudi 1er octobre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h20	B. Speh (Cornell)	Branching problems, translation functors and applications
09h30–10h20	B. Agrebaoui (Sfax)	Conformal solenoidal Lie (super)algebras and their cuspidal modules
10h30–11h00	*Pause café*	
11h00–11h50	B. Dali (Bizerte)	An Outline on the Cortex of Nilpotent Lie Algebras
12h00–12h30	M. Ait Ben Haddou (Meknès)	Lorentzian Algebraic Ricci Solitons on Four-Dimensional Nilpotent Lie Groups
12h30–14h30	*Déjeuner*	
14h30–15h20	A. Afgoustidis (Lorraine)	Well-tempered symmetric spaces
15h30–16h20	R. Beuzart-Plessis (Marseille)	Towards a local trace formula for local symmetric varieties
16h30–17h00	*Pause café*	
17h00–17h30	N. Prudhon (Metz)	Connes–Kasparov isomorphism and lowest K-types

Vendredi 2 octobre 2026

Horaire	Orateur	Titre de l'exposé
08h30–09h20	K. Kinvi (Abidjan)	On delta-Bochner theorem
09h30–10h20	Y. Tanaka (Tokyo)	Visibility, Coisotropicity, and Sphericity on Flag Manifolds and Applications to Multiplicity-Free Representations
10h30–11h00	*Pause café*	
11h00–11h50	A. Sasaki (Tokai)	Weyl group of reductive real spherical homogeneous spaces of one-dimensional fiber bundle type
12h00–12h30	J. B. Kayoya (Burundi)	The Zeta Functional Equation for Jordan Algebras of Type III
12h30–14h30	*Déjeuner*	
14h30–15h20	J. Vargas* (Córdoba)	Symmetry breaking operators for Discrete Series
15h30–16h20	D. Manchon (Clermont)	Post-Lie algebras, post-groups and post-groupoids
16h30–17h00	*Pause café*	
17h00–17h30		*Clôture*

** : exposé en ligne.*

Résumés des exposés

Alexandre Afgoustidis (Nancy)

Title: Well-tempered symmetric spaces

Abstract: I will discuss a class of real symmetric spaces for which the support of the Plancherel measure admits a reasonably simple description in terms of characters of real tori. These spaces are all tempered in the sense of Benoist and Kobayashi. I shall also comment on the Fell topology of the Plancherel support, mostly in the special case where this topology is Hausdorff. This is joint work with Peter Hochs, Shintaro Nishikawa and Yanli Song.

Boujemaa Agrebaoui (Sfax)

Title: Conformal solenoidal Lie (super)algebras and their cuspidal modules and q-analogues

Abstract:

Solenoidal Lie (super)algebras of contact type, their cuspidal modules and their q-analogues

V. Kac and J. van de Leur [7], give a conjecture on the clasification of superconformal alge bras ($\mathbb{Z}$-graded Lie superalgebras of growth one where the Witt algebra $\mathcal{W}(1) := \mathfrak{Der}(\mathbb{C}[t, t^{-1}])$ is a subalgebra of the even part). They study their central extensions (again the Virasoro algebra is a subalgebra of the even part). One important class is contact superalgebras. In a recent work (172 pages) C. Martìnez, O. Mathieu and E. Zelmanov [8], describe an explicit classification of all cuspidal modules over the superconformal algebras given in [7].

The $\mathbb{Z}^n$-graded algebras of Witt type and their central extensions were considered by R. Yu in [9]. Recently, Y. Billig and V. Futorny [6], considered the so called solenoidal Lie algebra $\mathcal{W}_\mu(n)$ ($\mathcal{W}_\mu(1) \cong \mathcal{W}(1)$ wich is simple of Witt type and they study its cuspidal modules.

In [4], we compute the universal central extension of the solenoidal Lie algebra, we obtain a higher rank Virasoro algebra. For $n = 1$, it is the well known Virasoro algebra-the universal central extension of $W(1)$-generated by the well known Gelfand-Fuks 2-cocycle. Then we study its Harish-Chandra modules. In an other work, [5], we introduce the solenoidal Heisenberg-Virasoro algebras and we study its Harish-Chandra modules.

We introduce the so called solenoidal contact Lie superalgebras and we compute their central extensions and we study their cuspidal modules. The case $N = 1$ is a work in progress in collaboration with V. Futorny.

We will consider also the q-analogues $q - W_\mu(n)$ and $q - HW_\mu(n)$ of $W_\mu(n)$ and $HW_\mu(n)$ respectively. We computed their universal central extensions $q - Vir_\mu(n)$ and $q - HVir_\mu(n)$ and we studied their cuspidal modules [1, 2] in progress.

Références

[1] B. Agrebaoui, M. Haddar, A. Hajjaji, W. Mhiri, A. Makhlouf The q-solenoidal (-Virasoro) algebra and its cuspidal modules, in progress.

[2] B. Agrebaoui, M. Haddar,A. Makhlouf The q-solenoidal (Heisenberg-Virasoro) algebras and its cuspidal modules

[3] B.Agrebaoui, V.Futorny, The solenoidal contact Lie superalgebras, their central extensions and their cuspidal modules. Work in progress.

[4] B.Agrebaoui, W.Mhiri, The solenoidal Virasoro algebra and its simple weight modules. Communi-cations in algebra,53(4), pp. 1568-1580.

[5] B.Agrebaoui, W.Mhiri, The solenoidal Heisenberg-Virasoro algebra and its simple weight modules arXiv :2403.07381 [math.RT]. To appear in Communications in algebra.

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[8] C. Martinez, O. Mathieu and E. Zelmanov, Cuspidal modules over superconformal algebras of rank ≥ 1.arXiv :2505.20974 [math.RT]

[9] R. W. T. Yu, Algèbre de Lie de type Witt. Communications in algebra, 25(5), 1471-1484(1997).

Malika Ait Ben Haddou (Meknes)

Title: Lorentzian Algebraic Ricci Solitons on Four-Dimensional Nilpotent Lie Groups

Abstract: There exist seven non-equivalent Lorentzian metrics on the nilpotent four-dimensional Lie group G_4. We show that three of these metrics do not yield algebraic Ricci solitons, while two are confirmed to be algebraic Ricci solitons. Among the latter, one metric is Ricci-flat under a certain condition but not flat. The remaining two metrics admit an algebraic Ricci soliton structure only in specific cases, depending on particular parameter relations. In contrast, for the nilpotent Lie group $H_3 \times \mathbb{R}$, five Lorentzian metrics are algebraic Ricci solitons and one is flat.

Références

[1] W. Batat and K. Onda, *Algebraic Ricci solitons of three-dimensional Lorentzian Lie groups*, J. Geom. Phys., **114**, 138–152 (2017).

[2] N. Bokan, T. Šukilović, and S. Vukmirović, *Lorentz geometry of 4-dimensional nilpotent Lie groups*, Geom. Dedicata, **177**, 83–102 (2015).

[3] T. H. Wears, *On Lorentzian Ricci solitons on nilpotent Lie groups*, Math. Nachr., **290**, no. 8-9, 1381–1405 (2017).

Joint work with : Youssef Ayad

Salma Azaouzi (Sfax)

Title: Hardy's theorem on compact extensions of Nilpotent Lie Groups

Abstract: This paper investigates a sharp analogue of Hardy's uncertainty principle for compact extensions of connected, simply connected nilpotent Lie groups, structured as semi-direct products $G = K \ltimes N$, where K is a compact subgroup of automorphisms of N.

By leveraging Mackey's little group method, representation theory, and orbital norm structures on the dual space $\mathfrak{g}^*$, we establish exact characterizations for the joint decay of a function $f \in L^1(G) \cap L^2(G)$ and its operator-valued Fourier transform $\Theta_\ell(f)$.

Specifically, under Gaussian-type decay conditions governed by parameter constants $\alpha, \beta > 0$ and polynomial order $m \in \mathbb{Z}_{\geq 0}$:

— If $\alpha\beta > \frac{1}{4}$, then $f = 0$ almost everywhere on G.

— If $\alpha\beta = \frac{1}{4}$, then

$$f(k, n) = f(k, t, x) = (f(k, 0, x) + H(k, t, x))\, e^{-\alpha\|t\|^2},$$

where $H(k, t, x)$ is a polynomial in t of degree at most $2m$ with $H(k, 0, x) = 0$, and is square-integrable in x.

— If $\alpha\beta < \frac{1}{4}$, there exist infinitely many linearly independent functions on G satisfying the given decay conditions.

Raphaël Beuzart-Plessis (Marseille)

Title: Towards a local trace formula for local symmetric varieties

Abstract: For G a reductive group over a local field of characteristic zero, the local trace formula of Arthur expresses a truncation of the trace of a convolution operator acting on L^2 in two different ways : one in terms of "geometric" distributions, featuring orbital integrals and certain weighted generalizations thereof, and one in terms of "spectral" contributions, involving (weighted) characters of irreducible representations.

In this talk, I will explain a generalization of Arthur's truncation procedure for general symmetric varieties, as well as a geometric expansion for certain types of symmetric varieties that we call "coregular". This includes, in particular, all symmetric varieties of the form $G(F)\backslash G(E)$, when E/F is a quadratic extension of local fields.

This is based on joint work with Chen Wan.

Abdelhamid Boussejra (Kenitra)

Title: On the L^2-range of generalized spectral projectors on vector bundles over rank one symmetric spaces

Abstract: Let G/K be a rank one Riemannian symmetric space. Let (τ, V_τ) be an irreducible representation of K, and $G \times_K V_\tau$ the associated homogeneous vector bundle.

By the Harish-Chandra Plancherel theorem, the space $L^2(G \times_K V_\tau)$ of square integrable sections decomposes into direct sum of continuous part $L^2_{\mathrm{cont}}(G \times_K V_\tau)$ and possibly of discrete part.

Let $E_{\sigma,\lambda}$ be the space of all generalized joint eigensections of the algebra of G-invariant differential operators on $G \times_K V_\tau$ with respect to a finite dimensional representation $\chi_{\sigma,\lambda}$.

There exists a family of linear maps

$$(Q_\lambda)_{\lambda \in \mathfrak{a}_+^*} := (Q_{\sigma,\lambda})_{\sigma \in \widehat{M}},$$

with

$$Q_\lambda : L^2_{\mathrm{cont}}(G \times_K V_\tau) \longrightarrow \bigoplus_{\sigma \in \widehat{M}} E_{\sigma,\lambda},$$

such that any $f \in C_c^\infty(G \times_K V_\tau)$ can be expanded into generalized joint eigensections as

$$f = \sum_{\sigma \in \widehat{M}} \int_{\mathfrak{a}_+^*} Q_{\sigma,\lambda} f \, \mathrm{d}\lambda.$$

In this talk, we shall give an image characterization of the L^2-range of the generalized spectral projectors Q_λ, thereby extending the Strichartz conjecture to vector bundles associated to arbitrary irreducible representations of K.

If time permits, we discuss the example of spectral projectors related to the Hodge–de Rham Laplacian on real hyperbolic spaces.

Béchir Dali (Bizerte)

Title: An Outline on the Cortex of Nilpotent Lie Algebras

Abstract: In this talk, we consider the open question : is the cortex of the dual of a nilpotent Lie algebra an algebraic set ? We give a partial answer by considering the class of two-step nilpotent Lie algebra $\mathfrak{g}$. For this class of Lie algebras we give an explicit algorithm for finding its corresponding cortex.

Next we give an example of 7-dimensional (real) nilpotent Lie algebra for which the cortex is a proper semi-algebraic set in the set of the common zeros of the G-invariant polynomials

on $\mathfrak{g}^\star$ namely the I-cortex, where G is the corresponding connected and simply connected Lie group and $\mathfrak{g}^\star$ is its dual.

Finally we study the cortex of a class of nilpotent Lie groups given by a semi-direct product of abelian groups $G := \mathbb{R}^m \rtimes_\pi V$ where π is the continuous representation of $\mathbb{R}^n$ on the m-dimensional (real) vector space V defined by

$$\pi(t_1, \ldots, t_n) = \exp\left(\sum_{i=1}^{n} t_i A_i\right)$$

with $\{A_1, \ldots, A_n\}$ is a set of pairwise commuting nilpotent matrices in $\mathbb{R}^{m\times m}$.

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Justin Feuto (Abidjan)

Title: Amalgam space on space of homogeneous type and the Hardy–Littlewood maximal operator

Abstract: We study the boundedness of the maximal Hardy–Littlewood operator on an amalgam of Lebesgue spaces defined on homogeneous spaces.

Hidenori Fujiwara (Fukuoka)

Title: Monomial representations of type I solvable Lie groups

Abstract: We would like to extend our previous results from exponential to type I solvable Lie groups (Joint work with Ali Baklouti).

Volker Heiermann (Marseille)

Title: On the determination of unramified spherical special automorphic representations

Abstract: The talk will be on the determination of special representations (i.e. square integrable, but not cuspidal) in the subspace of square integrable automorphic forms generated by spherical functions. This takes part of a joint project with M. DeMartino et E. Opdam.

Junko Inoue (Tottori)

Title: Holomorphically induced representations of some nilpotent Lie groups

Abstract: Let $G = \exp \mathfrak{g}$ be a simply connected nilpotent Lie group with Lie algebra $\mathfrak{g}$, and $f \in \mathfrak{g}^*$ be a real linear form.

Taking a complex subalgebra $\mathfrak{h}$ of the complexification of $\mathfrak{g}$ such that $f([\mathfrak{h}, \mathfrak{h}]) = \{0\}$, we define a holomorphically induced representation ρ of G as a subrepresentation of a monomial representation associated with the subgroup $\exp(\mathfrak{h} \cap \mathfrak{g})$ and the unitary character χ of $\exp(\mathfrak{h} \cap \mathfrak{g})$ satisfying $d\chi = if$.

In this talk, we are concerned with some cases such that the space $\mathfrak{h} + \overline{\mathfrak{h}}$ is not necessarily a subalgebra. We shall treat examples where the subspace $(\mathfrak{h} + \overline{\mathfrak{h}}) \cap \mathfrak{g}$ generates the Lie algebra $\mathfrak{g}$ and discuss conditions of non-vanishing of ρ and Frobenius reciprocity in the sense of distributions.

Jean Bosco Kayoya (Burundi)

Title: The Zeta Functional Equation for Jordan Algebras of Type III

Abstract:

Let W be a simple Euclidean Jordan algebra and let α be an involution of W. Writing

$$W = W^+ \oplus W^-,$$

the modification of W associated with α is the real Jordan algebra

$$W^\alpha = W^+ \oplus iW^-.$$

In the classification of simple real Jordan algebras obtained through involutions, Type III is characterized by the fact that W^+ is simple while its rank r_0 is strictly smaller than the rank r of W. In fact,

$$r = 2r_0.$$

This rank-doubling phenomenon is the essential structural feature distinguishing Type III from Type II.

The purpose of this work is to study the functional equation of the zeta integrals associated with the Type III modification W^α. The problem goes back to a conjecture formulated at the end of my doctoral thesis, defended in 1993. That conjecture, concerning the zeta distributions and their Fourier transform, has remained open despite several attempts to resolve it.

The present approach combines the structure of the involution α, the decomposition $W = W^+ \oplus W^-$, and the specific Peirce decomposition arising from the simple algebra W^+. The Type III condition ($r = 2r_0$) leads to a structure of the generalized power functions and of the associated zeta integrals that is different from the Type II case. We investigate how this structure is reflected in the analytic continuation, the Bernstein-type identities, and the gamma factors occurring in the functional equation.

More precisely, for a Schwartz function f, we consider zeta distributions of the form

$$Z(f, s) = \int_{\mathcal{O}} \Delta_s(x) f(x)\, dx,$$

where $\mathcal{O}$ denotes the relevant open orbit and Δ_s is the generalized power function associated with the Jordan structure. The main question is to determine the precise relation between $Z(f,s)$ and the zeta distribution associated with the Fourier transform $\widehat{f}$, and to identify the transformation of the parameter s and the corresponding gamma factor in the Type III setting.

The results are intended to provide a resolution, or a decisive reformulation, of the conjecture formulated in 1993 and to clarify the role played by the Type III involution in the functional equation of zeta distributions on non-Euclidean Jordan algebras.

Kangni Kinvi (Abidjan)

Title: On delta-Bochner theorem

Abstract: Let G be a locally compact group, K a large compact subgroup of G and d an arbitrary class of irreducible unitary representations of K. In this talk, before giving an extension of Bochner theorem, we'll construct the spherical Fourier transform according to the unitary dual of K , construct the $p-\delta$-spherical grassmannian using a generalized Abel transform and study a relationship with disintegration of representations.

Toshiyuki Kobayashi (Tokyo)

Title: Hidden Symmetry and Spectral Analysis on Locally Symmetric Spaces beyond the Riemannian Setting

Abstract: Branching problems in representation theory ask how irreducible representations behave upon restriction to subgroups. The problem becomes particularly challenging when the representations are infinite-dimensional and the subgroup is non-compact. In this talk, I will discuss applications of branching laws to spectral analysis on standard locally symmetric spaces, extending beyond the classical Riemannian setting. Recent advances have addressed several challenges in global analysis with indefinite metrics, largely due to progress in the branching theory of infinite-dimensional representations of reductive groups. These developments are closely related to geometric structures with hidden symmetries on certain spherical varieties. I will highlight several key ideas and perspectives while avoiding technical details as much as possible. The talk is a continuation of a three lectures given the previous week, but no prior attendance is assumed.

Khalid Koufany (Nancy)

Title: Group and multiplication invariant subspaces

Abstract: This talk addresses a question posed by Adam Korányi and is based on ongoing joint work with Genkai Zhang.

Let $G = SU(1,1)$, or more generally its universal covering group, acting on the unit disc $\mathbb{D}$. Let $K \subset G$ denote the stabilizer of the origin.

Consider the representation U induced, in the sense of Mackey, by a unitary character of K, realized as a multiplier representation on an L^2-space of functions on $\mathbb{D}$. Let M_z denote the operator of multiplication by the coordinate function z.

The subspace of holomorphic functions is invariant under both U and M_z. Korányi's question is whether it is the only nontrivial proper closed subspace with this joint invariance property.

In this talk, I will discuss this problem and present an answer to Korányi's question.

Ajay Kumar (Delhi)

Title: L^p-Gabor transform norm on locally compact groups

Abstract: We study the L^p-Gabor transform $G_\psi f$ for $f \in L^p(G)$, window function $\psi \in L^q(G)$, $1 < p \leq 2$ and $q = \dfrac{p}{p-1}$, where G is a locally compact group of type I which is separable and unimodular.

Next, we discuss the L^p-Gabor transform norm given by

$$\|G^p(G)\| = \sup_{f,\psi \neq 0} \left\{ \frac{\|G_\psi f\|_q}{\|f\|_p \|\psi\|_q} \right\} \leq 1$$

and establish that $\|G^p(G)\| = 1$ if and only if G has a compact open subgroup. This provides us several classes of non-abelian groups G having $\|G^p(G)\| = 1$.

We show that

$$\|G^p(\mathbb{R}^n \rtimes K)\| = (A_p)^n,$$

where K is a compact subgroup of $\mathrm{Aut}(\mathbb{R}^n)$ and

$$A_p = p^{\frac{1}{2p}} q^{-\frac{1}{2q}}.$$

If N is a closed normal subgroup of G such that G/N is compact, then we have

$$\|G^p(G)\| \leq \|G^p(N)\|.$$

Also, for any compact normal subgroup K of G, we have

$$\|G^p(G/K)\| \leq \|G^p(G)\|.$$

These results allow us to explicitly compute $\|G^p(G)\|$ for several classes of groups including groups in $[FC]^- \cap [SIN]^-$, the Heisenberg group over p-adic numbers Ω_p, $\mathfrak{h}_n \times \mathbb{R}^m \times \Omega_p$,

$$\mathfrak{h}_3/N, \qquad N = \left\{ \begin{bmatrix} 1 & 0 & n \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} : n \in \mathbb{Z} \right\},$$

$\mathfrak{h}_n \times D$, $\mathfrak{h}_n \times \mathbb{R}^m \times D$, $(\mathfrak{h}_n \times D) \ltimes K$, $(\mathfrak{h}_n \times \mathbb{R}^m) \ltimes K$, where $\mathfrak{h}_n$ is the Heisenberg group, D is a discrete group of type I and K is a compact group. Bounds for connected and simply connected nilpotent Lie groups can also be obtained.

Abdenacer Makhlouf (Mulhouse)

Title: On restricted Lie triple systems

Abstract: Lie triple systems are relevant in the study of symmetric spaces. The aim of this talk is to introduce the theory of Lie triple systems in positive characteristic. We discuss some constructions, representations, restricted Rota–Baxter operators, cohomology and deformations. This talk is based on joint works with Jon Beristain.

Dominique Manchon (Clermont)

Title: Post-Lie algebras, post-groups and post-groupoids

Abstract: Post-groups were introduced in 2023 by C. Bai, L. Guo, Y. Sheng and R. Tang. They are closely related to skew-braces (L. Guarnieri and L. Vendramin, 2017) and braided groups (J.-H. Lu, M. Yan, and Y. Zhu, 2000). Post-Lie algebras, introduced by B. Vallette in 2007, are to post-groups what Lie algebras are to groups. Post-groupoids have been recently introduced by Y. Li and Y. Sheng. I shall give a detailed account of these notions, and outline

an application to geometric numerical integration via the Butcher post-groupoid. Based on a joint work in progress with Eugen Bronasco, Ludwig Rahm and Gilles Vilmart.

Norbert Mahoungou Moukala (Brazzaville)

Title: Représentations d'algèbres de Lie-Rinehart gén éralisées

Abstract: The notion of a Lie–Rinehart algebra, introduced by Herz [1], provides an algebraic framework that generalizes the concept of a Lie algebroid [3]. Subsequently, Huebschmann [2] developed the theory of Lie–Rinehart algebras systematically and highlighted their significant role in algebraic and differential geometry, particularly in Poisson geometry.

In this talk, we introduce and study generalized Lie–Rinehart algebras [4] as a natural extension of Lie–Rinehart algebras, and we present several examples illustrating their structure and geometric significance. We then introduce the notion of a representation of a generalized Lie–Rinehart algebra and develop several constructions. We establish a natural one-to-one correspondence between representations of generalized Lie–Rinehart algebras and modules over generalized Lie–Rinehart algebras.

Keywords : First-order differential operators, Generalized Lie–Rinehart algebras, Representations, Modules.

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Salah Mehdi (Metz)

Title: Representation theoretic symplectic Dirac operators

Abstract: After introducing the standard Dirac operators and reviewing some of their key properties in representation theory, we will define symplectic Dirac operators. We will explain how they differ from their standard counterparts, describe an analogue of Parthasarathy's inequalities, and derive a criterion for unitarity. These results are part of ongoing joint work with D. Ciubotaru, G. Liu and N. Prudhon.

Aboubacar Nibirantiza (Burundi)

Title: Geometric quantization of coadjoint superorbits and Schrödinger–Fock representations of the Heisenberg supergroup $\mathcal{H}^{m|n}$

Abstract: In the framework of Kirillov's orbit method for nilpotent supergroups, coadjoint superorbits of the Heisenberg supergroup naturally carry supersymplectic structures arising from the Kirillov–Kostant–Souriau form. Their geometric quantization provides a geometric realization of the irreducible unitary representations of the Heisenberg supergroup. In particular, after choosing an appropriate polarization, the resulting quantum state space is identified with

$$L^2(\mathbb{R}^m) \otimes \Lambda^\bullet(\mathbb{C}^n),$$

combining the bosonic Schrödinger representation with the fermionic Fock representation. Thus $\mathfrak{h}^{m|n}$ provides the simplest geometric model combining bosonic and fermionic quantization.

The bosonic sector reproduces the canonical commutation relations, while the fermionic sector generates a Clifford algebra through anticommutation relations. This construction shows that Schrödinger–Fock representations arise naturally as the geometric quantization of coadjoint superorbits, thereby providing a deep connection between supergeometry, supersymplectic structures, and the representation theory of nilpotent supergroups. We begin by explicit calculations for the case $m = n = 1$ and generalize to arbitrary values of m and n.

Nicolas Prudhon (Metz)

Title: Connes Kasparov isomorphism and lowest K-types

Abstract: Given a connected linear real reductive group G, Connes and Kasparov defined in the early eighties a map that associates to a (virtual) representation V of its maximal compact subgroup K the G-index of the Dirac operator on G/K twisted by V— an element of the K-theory group of the reduced C^*-algebra of G and they conjectured it was an isomorphism. In 1987, Wassermann announced in outline a proof of this conjecture, using representation theory. Clare, Higson, Song, and Tang finally explained this proof in full detail in 2023. Their proof is divided into two parts. First, the structure of the reduced C^*-algebra is detailed using Harish-Chandra's completeness theorem and the theory of Knapp-Stein operators. This structural result then yields the identification of generators of its K-theory. Second, the theory of Vogan's lowest K-types is used to compute the G-index map in terms of these generators. In this talk, we will explain how one can switch the order of these two parts,leading to a reduction of the proof of the conjecture to lower-dimensional subgroups of G (which may not be compact)and to the understanding of some representations of those subgroups. This amounts to establishing abstract isomorphisms between certain ideals of the reduced C^*-algebra of these subgroups and that of G. Finally, we geometrically construct a homomorphism between the K-theory of the ideals in question that concretely realizes these abstract isomorphisms, providing a construction parallel to cohomological induction. This is a work in progress with A. Afgoustidis.

Aymen Rahali (Monastir)

Title: On Visible Actions in Cartan Motion Groups

Abstract: Visible actions, introduced by Toshiyuki Kobayashi, provide a geometric framework with important applications to representation theory and complex geometry.

In this talk, we study strongly visible actions in the setting of Cartan motion groups. Our main result is a characterization of the closed subgroups whose actions on the complexified Cartan space are strongly visible.

The proof relies on the geometry of group orbits and the existence of suitable slices. This characterization sheds new light on the interplay between the geometry of Cartan motion groups and the theory of visible actions, and opens the way to further applications in representation theory.

Hedi Regeiba (Gabes)

Title: THE C*-ALGEBRAS OF SOME LIE GROUPS FORMED BY A SEMI-DIRECT PRODUCT

Abstract: This work is devoted to the study and description of the C*-algebras associated with certain Lie groups constructed as semi-direct products. The presentation focuses on two main problems : the description of the C*-algebra of the Heisenberg motion groups

$$G_n = \mathbb{T}^n \ltimes H_n,$$

and, more generally, the description of the C*-algebra associated with a semi-direct product

$$K \ltimes A,$$

where K is a compact group acting on an abelian locally compact group A.

Atsumu Sasaki (Tokai)

Title: Weyl group of reductive real spherical homogeneous spaces of one-dimensional fiber bundle type

Abstract: It is well known that Cartan decompositions and Weyl groups play fundamental roles in harmonic analysis on semisimple symmetric spaces.

For reductive real spherical homogeneous spaces, which form a broad class containing semisimple symmetric spaces, the existence of Cartan decompositions has recently been established.

In this talk, we study reductive real spherical homogeneous spaces of one-dimensional fiber bundle type. We give an explicit description of Cartan decompositions for such spaces. Moreover, we introduce the corresponding Weyl groups and determine their group structures.

Birgit Speh (Cornell)

Title: Branching problems, translation functors and applications

Abstract: I am presenting joint work with Professor Kobayashi. We worked out a new approach to symmetry breaking for pairs of real forms of $(GL(n,\mathbb{C}), GL(n-1,\mathbb{C}))$.

Translation functors are powerful tools for studying families of representations of a single reductive group G. However, when applied to a pair of groups $G \supset G'$, they can significantly alter the nature of symmetry breaking between the representations of G and G', even within the same Weyl chamber of the direct product group $G \times G'$.

We introduce the concept of fences for the interleaving pattern, which provides a refinement of the usual notion of "walls of Weyl chambers. We then establish a theorem stating that the multiplicity remains constant unless these fences are crossed, together with a new general vanishing theorem for symmetry breaking.

Sundaram Thangavelu (Bengaluru)

Title: A Fourier transform for operators

Abstract: Using an irreducible unitary representation of the twisted Heisenberg group acting on twisted Fock spaces we define a Fourier transform on the space of all Hilbert–Schmidt operators acting on $L^2(\mathbb{R}^n)$. We describe some of the main features of this transform including an analogue of Hardy's theorem.

Jorge Vargas (Cordoba)

Title: Symmetry breaking operators for Discrete Series

Abstract: We fix a connected simple Lie group G and $H \subseteq G$ a closed reductive, connected subgroup. For a unitary irreducible representation (π, V) of G, a *symmetry breaking operator* S is an intertwining map from $\mathrm{res}_H(V)$ into an irreducible H-factor (ρ, U). When V, U are realized as spaces of smooth sections of homogeneous vector bundles, T. Kobayashi has defined and studied the concept of representing S as a *differential operator*. In the realm of square integrable representations in joint work with B. Ørsted we have shown : a) Whenever (π, V) admits a nonzero symmetry breaking operator represented by a differential operator, then, $\mathrm{res}_H(V)$ is discretely decomposable. Besides, if every symmetry breaking operator is represented

via a differential operator, then, $\mathrm{res}_H(V)$ is H-admissible. b) Whenever (G, H) is a holomorphic symmetric pair, the associate pair (G, H_0), allow us to define the concept of *normal derivative* symmetry breaking operator. We have that if every symmetry breaking operator is represented via normal derivative, then, except for $\mathfrak{g} \ncong \mathfrak{su}(m,n), m > 1, n > 1$, $[[\mathfrak{p}^+_{\mathfrak{h}}, \mathfrak{p}^-_{\mathfrak{h}_0}], \mathfrak{p}^-_{\mathfrak{h}_0}] = \{0\}$, and the lowest K-type of π is one dimensional. The talk will be centered on the existence or non existence of normal derivative operators, we will present the basic concepts. Our results complement the work of Kobayashi-Pevzner and Nakahama.

Robert Yuncken (Nancy)

Title: Harish-Chandra's principle via the Satake groupoid

Abstract: In his programme classifying the tempered dual of a real reductive group, one of Harish-Chandra's most important observations was the principle that every tempered irreducible representation is either a discrete series representation (mod centre) or else is a subrepresentation of a parabolically induced representation from a Levi subgroup. The point of this talk is to show that this spectral decomposition can be deduced rather easily from a geometric decomposition of a Lie groupoid. The groupoid is called the Satake groupoid because it is built from the Satake compactification of G/K. (Joint work with J. Bradd and N. Higson.)

Oshima Yoshiki (Tokyo)

Title: Existence and non-existence of discrete series for homogeneous spaces

Abstract: When a real reductive Lie group G acts transitively on a manifold X, an irreducible subrepresentation of the unitary representation $L^2(X)$ is called a discrete series representation of X.

While the discrete series plays a central role in harmonic analysis on symmetric spaces, its behavior on general homogeneous spaces is less understood. In this talk, we discuss conditions for the existence and non-existence of discrete series for general homogeneous spaces.

We provide a sufficient condition for existence in terms of coadjoint orbits and a sufficient condition for non-existence derived from Benoist and Kobayashi's work on tempered homogeneous spaces. We also illustrate these conditions in the case where $G = SL(n, \mathbb{R})$.

This talk is based on joint works with Benjamin Harris and with Kazushi Maeda.

Tanaka Yuichiro (Tokyo)

Title: Visibility, Coisotropicity, and Sphericity on Flag Manifolds and Applications to Multiplicity-Free Representations

Abstract: A unitary representation of a locally compact group is multiplicity-free if each irreducible representation occurs with multiplicity at most one in its irreducible decomposition.

In order to understand multiplicity-free phenomena from a geometric viewpoint, T. Kobayashi introduced the theory of visible actions for holomorphic actions of Lie groups on complex manifolds. This theory provides a unified framework for many known examples and produces new ones through Kobayashi's propagation theorem of the multiplicity-freeness property for visible actions.

In this talk, I will discuss some relationships among visibility, coisotropicity, and sphericity for reductive group actions on flag manifolds. I will also explain how these geometric properties can be applied to representation theory via a cohomological version of Kobayashi's propagation theorem.