Université de Haute Alsace

IRIMAS - Département de Mathématiques

Journées d'Algèbre Metz-Mulhouse 2025

Algebras and Forms in Geometry and Beyond

In honour of Saïd Benayadi for his 60th anniversary

Mulhouse 11-12 September 2025

Faculté des Sciences et Techniques, Room 201
18, rue des Frères Lumière, Mulhouse

Organizers

Martin Bordemann (University of Haute Alsace)
Abdenacer Makhlouf (University of Haute Alsace)
Camille Laurent-Gengoux (Lorraine University)
Saïd Benayadi (Lorraine University)

Program

Thursday 11th September 2025

— 14 :00 Openning
— 14 :10-14 :50 Mohamed Boucetta
— 14 :55-15 :35 Helena Albuquerque
— Coffee break
— 16 :00-16 :40 Sofiane Bouarroudj
— 16 :45-17 :25 Elisabete Barreiro
— 19 :00 Dinner

Friday 12th September 2025

— 8 :30- 9 :10 Alberto Elduque
— 9 :15-9 :55 Said Boulmane
— Coffee break
— 10 :15-10 :55 Ignacio Bajo

— 11 :00-11 :40 Malika Ait Benhaddou
— 11 :45-12 :25 Jon Beristain
— Lunch
— 14 :00-14 :40 Camille Laurent-Gengoux
— 14 :45-15 :25 Mohsen Masmoudi
— Coffee break
— 15 :45-16 :25 Angela Pasquale
— 16 :30-17 :10 Yvain Bruned

Abstracts

Malika Ait Benhaddou (Meknes University, Morocco)
Title : The isometry group of the 4-dimensional oscillator group.
Abstract :

Helena Albuqueque (Coimbra University, Portugal)
Title : Poisson Algebras and Symmetric Leibniz Bialgebras
Abstract :We present all Symmetric Leibniz Algebra structures whose underlying Lie Algebra is an Oscillator Algebra

Jon Beristain (University of Haute Alsace)
Title : On restricted Lie color triple system, restricted Rota-Baxter operator and related structures
Abstract : Lie triple systems were introduced by Jacobson in order to study the representations of the Jordan algebras. Lie triple systems are related to symmetric spaces in the same way that Lie algebras are related to Lie groups. Indeed, Lie triple systems are tangent spaces of symmetric spaces. In characteristic p>0, many Lie algebras have additional structure, which Jacobson had formally defined and named restricted structure. Hodge defined a restricted structure on Lie triple systems with the aim of preserving the link between Lie algebras and Lie triple systems and shown then similar results, as the Jacobson's theorem. Lie color algebras and Lie color triple systems are graded vector spaces with a bracket and triple bracket compatible with the graduation and a bicharacter. They are generalizations of Lie algebras and Lie triple systems. In this talk, we define the restricted Lie color triple systems, and generalize some classic results. Especially we show that the Jacobson's theorem remains true. Then, we define the representations of a Lie color triple system, and the restricted representations of a restricted Lie color triple system, and show that we can endow the semi-direct product with a structure of a restricted Lie color triple system.

Rota-Baxter algebras, introduced by Baxter from probability, generalize integration by parts and later reappeared in renormalization theory. They have since found applications in combinatorics, number theory and operads. In Lie algebras, Rota-Baxter operators arose independently as operator forms of the classical Yang-Baxter equation (CYBE). The CYBE, central in integrable systems and quantum groups, admits an operator formulation equivalent to the Rota-Baxter relation of weight zero. Rota-Baxter operators are also related to the splitting of algebraic structures. Kupershmidt further generalised these operators into O-operators, also known as relative Rota-Baxter operators. In this talk, we define what is a restricted Rota-Baxter operator on a restricted Lie algebra and a restricted Lie triple system and the usual connections with pre-Lie structures.

Sofiane Bouarroudj (New York University, Abu Dhabi, Emirats)

Title : On Zinbiel and Tortkara superalgebras

Abstract : We study Zinbiel superalgebras and special Tortkara superalgebras, highlighting key differences between the super and the non-super setting. We present examples of Zinbiel superalgebras with Rota-Baxter operators and construct a basis for free Zinbiel superalgebras. Moreover, we establish a superalgebraic analogue of the Lie criterion for Zinbiel superalgebras. In contrast to the classical case, some homomorphic images of special Tortkara superalgebras on two generators are exceptional. Finally, we present a classification of all Tortkara superalgebras of dimensions 2 and 3.

This is a joint work with F. Mashurov.

Mohamed Boucetta (Marrakech University , Morocco)

Title : Special bi-invariant linear connections on Lie groups and finite dimensional Poisson

Abstract :Let G be a connected Lie group and $\mathfrak{g}$ its Lie algebra. We denote by ∇^0 the torsion free bi-invariant linear connection on G given by $\nabla^0_X Y = \frac{1}{2}[X, Y]$, for any left invariant vector fields X, Y. A Poisson structure on $\mathfrak{g}$ is a commutative and associative product on $\mathfrak{g}$ for which ad_u is a derivation, for any $u \in \mathfrak{g}$. A torsion free bi-invariant linear connections on G which have the same curvature as ∇^0 is called special. We show that there is a bijection between the space of special connections on G and the space of Poisson structures on $\mathfrak{g}$. We compute the holonomy Lie algebra of a special connection and we show that the Poisson structures associated to special connections which have the same holonomy Lie algebra as ∇^0 possess interesting properties. Finally, we study Poisson structures on a Lie

algebra and we give a large class of examples which gives, of course, a large class of special connections.

This is a joint work with Saïd Benayadi.

Said Boulmane (University Moulay Ismail, Meknes, Errachidia, Morocco)

Title : Third power-associative Novikov algebras

Abstract : we explore the structure of third power-associative Novikov algebras $(\mathcal{A}, \cdot)$. First, we observe that they are power-associative . We establish that, in such cases, the anti-commutator $x \circ y = x \cdot y + y \cdot x$ induces the structure of a Jordan algebra. Through detailed characterizations, we prove that $(\mathcal{A}, \cdot)$ is 3-nilalgebra if and only if the anti-commutator satisfies a Jacobi-Jordan identity. Furthermore, we investigate a specific class of power-associative Novikov algebras $(\mathcal{A}, \cdot, B)$, endowed with a non-degenerate symmetric bilinear form B such that left multiplications are skew-symmetric. We show that any such algebra must be nilpotent. Then, we provide an inductive description of this class through the double extension method introduced by Aubert and Medina and give a classification of these algebras up to dimension four. The talk is based on a joint work with Saïd Benayadi and Hamza Edarif.

Ignacio Bajo (Vigo University, Spain)

Title : Non-existence of nontrivial biderivation type structures on perfect Lie algebras

Abstract : An algebra of biderivation type is a non-associative Lie algebra such that left multiplications and right multiplications are derivations of its algebra of commutators. It can be seen that every algebra of biderivation type is Lie-admissible and it is completely described by its commutator Lie algebra and a symmetric biderivation of such Lie algebra. We show that there are no symmetric non-zero biderivations on perfect Lie algebras of finite dimension over a field of characteristic zero. This clearly means that the only structure of biderivation type that can be constructed in a perfect Lie algebra is the Lie structure itself. This is a joint work with Sa"ıd Benayadi and Hassan Oubba.

Elisabete Barreiro (Coimbra University, Portugal)

Title : Nearly associative algebras

Abstract : In this talk, we will present a comprehensive study of nearly associative algebras. Our research shows that these algebras are power associative Lie-admissible for which the related Lie algebra is solvable, and are also Jordan-admissible.

Furthermore, we describe the features of finite-dimensional nearly associative algebras that are nilpotent. In addition, we define the concepts of radical and semisimplicity for this type of algebras. We give a characterization of semisimple nearly associative algebras and prove the Wedderburn Principal Theorem for them.

Lastly, we deal with quadratic nearly associative algebras. We provide a characterization and then an inductive description of them through the process of double extension.

The talk is based on joint work with Saïd Benayadi and Carla Rizzo.

Yvain Bruned (Lorraine University)
Title : tba
Abstract :

Alberto Elduque (Zaragoza University, Spain)
Title : From the Albert algebra to Kac's ten-dimensional Jordan superalgebra

Abstract : In 2005, Kevin McCrimmon considered the Grassmann envelope of Kac's ten-dimensional simple Jordan superalgebra and obtained, in his own words, the bizarre result that in characteristic 5 (but not otherwise), it is the Jordan algebra over a shaped cubic form over the even part of the Grassmann algebra. This means that this Jordan superalgebra satisfies the super version of the Cayley-Hamilton equation of degree 3.

This bizarre result led to the discovery of a new exceptional simple Lie superalgebra : el(5 ; 5), specific of characteristic 5.

It turns out that this bizarre result is a direct consequence of the fact that, in characteristic 5, Kac's Jordan superalgebra can be obtained from the Albert algebra using a semisimplification process in suitable tensor categories.

The talk will be devoted to explaining this process.

Camille Laurent-Gengoux (Lorraine University)
Title : Intégrateurs de Poisson et Groupoïdes symplectiques.

Abstract : Je vais raconter la thèse de mon ancien doctorant Oscar Cosserat, en cotutelle avec Vladimir Salnikov. Il s'agit d'exploiter le groupoïde symplectique afin de trouver des intégrateurs numériques des équations hamiltoniennes. Je finirai par des idées sur de possibles généralisations en utilisant des outils de Androulidakis et Skandalis.

Mohsen Masmoudi (Lorraine University)
Title : Structures de Poisson quadratiques
Abstract :

Angela Pasquale (Lorraine University)
Title : tba
Abstract :