	13/04/26	14/04/26	16/04/26	17/04/26
Chair	Azat Gainutdinov	Yuri Bahturin	Csaba Schneider	Tomasz Brzezinski
10:00 – 11:00	Andrey Lazarev	Anupam Singh	Andrea Appel	Vicent Pérez Calabuig
11:00 – 11:30	Elena Pascucci	Kauê Pereira	Giovanni Bazzoni	Paola Stefanelli
11:30 – 12:00	c/break-1	c/break-3	c/break-5	c/break-7
Chair	Paolo Saracco	Thiago Castilho	Nicolas Gilliers	Maxime Fairon
12:00 – 12:30	Fabrizio Martino	Ignacio Bajo	David Stewart	Andrea Sciandra
12:30 – 13:00	Jonas Deré	Raschid Abedin	Manuel Mancini	Andrea Albano
13:00 – 15:00	Lunch-1	Lunch-2	Lunch-3	Lunch-4
Chair	Andrey Lazarev	Anupam Singh	Andrea Appel	Vicent Pérez Calabuig
15:00 – 16:00	Azat Gainutdinov	Yuri Bahturin	Csaba Schneider	Tomasz Brzezinski
16:00 – 16:30	Paolo Saracco	Sebastiano Argenti	Nicolas Gilliers	Kobiljon Abdurasulov
16:30 – 17:00	c/break-2	c/break-4	c/break-6	c/break-8
Chair		Ignacio Bajo		Andrea Sciandra
17:00 – 18:00		Thiago Castilho		Maxime Fairon
20:30 – 23:00		Dinner-1		Dinner-2

Andrea **Albano**
University of Salento, Italy

On the set-theoretic Yang-Baxter equation and the reflection equation

Abstract: The aim of this talk is to provide a basic overview of the set-theoretic Yang-Baxter equation (YBE) with a particular attention to the interplay between non-degenerate solutions and their associated reflections. The Yang–Baxter equation (YBE) is a fundamental relation in mathematical physics that has its roots in the investigation of many-particle interactions in two-dimensional quantum dynamical systems. As a result of their study on soliton collisions on the half-line, V. Caudrelier and Q. Zhang formulated the set-theoretic reflection equation and determined first classification results. Nowadays, despite the efforts of many mathematicians, the task of understanding the interaction between solutions and reflections is still an open problem as well as a rich source of interesting questions. Based on a joint work with M. Mazzotta and P. Stefanelli.

Andrea **Appel**
University of Parma, Italy

Quantum toroidal algebras, affine Yangians and abelian qKZ equations

Abstract: In this talk, I will present the construction of abelian meromorphic R-matrices for quantum toroidal algebras, providing a meromorphic braiding on category O representations with respect to the Drinfeld tensor product. I will then explain how, under the equivalence of Gautam and Toledano Laredo, these R-matrices compute the monodromy of the abelian qKZ equations for the corresponding affine Yangians. This is based on joint work with S. Gautam.

Andrea **Sciandra**
Free University of Brussels, Belguim

Yetter–Drinfeld post-Hopf algebras, Rota–Baxter operators, and semi-abelian categories

Abstract: Post-Lie algebras were introduced by Vallette and have since found several significant applications. Their adjunction with relative Rota–Baxter operators on Lie algebras was generalized by Li, Sheng, and Tang to the setting of cocommutative post-Hopf algebras. In this talk, we show how to extend this result to a not-cocommutative setting, providing an adjunction between Yetter–Drinfeld post-Hopf algebras and Yetter–Drinfeld relative

Rota–Baxter operators. Moreover, the isomorphism between cocommutative post-Hopf algebras and cocommutative Hopf braces is shown to extend to Yetter–Drinfeld post-Hopf algebras and Yetter–Drinfeld braces and, via an isomorphism with matched pairs of actions on Hopf algebras, these structures provide solutions of the quantum Yang–Baxter equation. Finally, we prove that the category of cocommutative Hopf braces (equivalently, cocommutative post-Hopf algebras) is semi-abelian, similarly to the categories of groups, Lie algebras and cocommutative Hopf algebras, and we provide a torsion theory for this category using post-Lie algebras and skew braces. This talk is partially based on a joint work with D. Ferri and on a joint work with M. Gran.

Andrey **Lazarev**
Lancaster University, UK

Duality for algebras and coalgebras

Abstract: One manifestation of Koszul duality is an equivalence of the derived category of an algebra and the coderived category of its Koszul dual coalgebra. I will discuss derived duality functors for algebras and their ‘mirror’ duality functors for Koszul dual coalgebras. Particularly interesting examples are related to derived categories of graded Lie algebras. As an application, a generalization of old results of Hazewinkel and Koszul on Poincaré duality for ungraded Lie algebras is obtained. As a topological application, a Calabi-Yau structure is constructed on the category of rational infinity-local systems on simply-connected topological spaces with totally finite-dimensional rational homotopy. These results are joint with J. Chuang, M. Booth, and R. Tang.

Anupam **Kumar Singh**
Indian Institute of Science Education and Research, India

Polynomial maps on (non-)associative algebras

Abstract: Solving equations is a fundamental problem in Mathematics and has wide applications in Physics and computer science. This curiosity led to the Waring problem in number theory, and more generally, over rings; the Waring-like problem over groups; Ore’s conjecture; and the L’vov-Kaplansky conjecture, etc. Let A be an associative (need not be commutative) algebra over a field k. A polynomial $f(x_1, x_2, \ldots, x_m)$ in the ring $A[x_1, \ldots, x_m]$, with non-commuting variables, gives rise to a map $w : A^m \to A$ defined by $(a_1, \ldots a_m) \to f(a_1, \ldots, a_m)$, called a polynomial map with constant (or simply a polynomial map when the coefficients are from k). The main question is to study images of such maps (for example, sum of powers, commutators, multi-linear polynomials, etc.). When A is non-associative, one can also ask similar questions for certain polynomials. In this talk, we present our work in the case where A is a matrix algebra, quaternions, or octonions for certain polynomials. We also present some recent work on power maps from matrix algebra over a finite local principal ideal ring of length 2.

Azat **Gainutdinov**
Institut Denis Poisson, CNRS, France

Semi-simple commutative algebras in non-semisimple braided tensor categories

Abstract: Vertex-Operator Algebras are certain generalizations of both Lie algebras and commutative algebras, and became an important subject in pure mathematics, while they have originally appeared in mathematical physics in 80's in an attempt to formulate the locality axiom in 2d conformal field theories. Their representation categories have naturally a braided tensor structure and provide representations of Artin's braid groups that don't factor through symmetric groups. Motivated by representation theory of the VOAs, we study simple commutative algebras living in braided tensor categories of modules over the famous Virasoro algebra at certain specific values of the Virasoro central charge. The internal representation theory of such simple algebras is surprisingly rich and has deep connections with Lie theory. In particular, we obtain a new class of T-crossed braided tensor categories, graded by T - the maximal torus of a simple Lie group G - and with associators given by a 3-cocycle from non-zero cohomology class in the group of locally continuous cohomologies of T. In the case of G=SL(2), this construction provides an interesting non-semisimple rigid monoidal 2-category structure on the group $\mathbb{C}^*$.

Csaba **Schneider**
Federal University of Minas Gerais, Brazil

Computing invariants of Lie algebras using algebra and geometry

Abstract: Given a Lie algebra L, the rational functions that are invariant under the adjoint action of L form a field which contains the algebra of polynomial invariants. I will present several algorithmic approaches to compute explicit generators of the field of rational invariants, and, in some cases, generators for the algebra of polynomial invariants. The procedures work best for nilpotent Lie algebras and for some classes of solvable Lie algebras. Some algorithms that I present are purely algebraic, others use foliations by integral curves of the vector fields that correspond to the adjoint actions of the basis elements, while others use the geometry of differential k-forms. These approaches show how algebra and geometry get intertwined when working with Lie algebras. These procedures are implemented in the

computer algebra system SageMath and I will compare the implementations from the point of view of practicality and running times.

David **Stewart**
University of Manchester, UK

Maximal subalgebras of pseudo-simple groups

Abstract: In the 1950s, Dynkin worked out all the maximal subalgebras of complex simple Lie algebras. In the 1980s onwards, Seitz, together with Liebeck and Testerman, worked out all the maximal subgroups of positive dimension in simple groups over algebraically closed fields. Around 2010, Conrad, Gabber, and Prasad worked out the classification of pseudo-reductive groups. Most of the maximal subgroups of the pseudo-reductive groups seem to arise in some obvious way from those of related reductive groups. Mike Bate and Adam Thomas, and I have been looking to see if there is anything new and unusual to discover. There is at least something unexpected in an F_4-type group when $p = 3\ldots$

Elena **Pascucci**
Sapienza University of Rome, Italy

Polynomial Identities through Kemer's Lens

Abstract: This talk surveys the role of fundamental superalgebras in Kemer's Representability Theorem and, consequently, in the solution of Specht's problem for associative algebras. In this context, we briefly retrace the development of these ideas, highlighting similarities and differences with the non-associative case. We then review the main results on fundamental algebras, both in the ordinary setting and in the presence of additional structures. A unifying perspective is provided by their combinatorial characterization in terms of multialternating polynomials and geometric parameters. This framework clarifies key examples, including minimal algebras, upper triangular matrix algebras, and related subalgebras obtained by identifying simple components, and leads to further characterizations arising from representation theory. This is based on various joint works with Eli Aljadeff, Antonio Giambruno, Antonio Ioppolo, Daniela La Mattina, and Ernesto Spinelli.

Fabrizio **Martino**
University of Palermo, Italy

Codimension growth of varieties of non-associative algebras

Abstract: Let F be a field of characteristic zero and let A be a non-associative algebra over F. Denoting by $\mathrm{Id}(A)$ the T-ideal of polynomial identities of A, the codimension sequence of A is defined by

$$c_n(A) = \dim_F \frac{P_n}{P_n \cap \mathrm{Id}(A)},$$

for all $n \geq 1$, where P_n denotes the space of multilinear polynomials of degree n. In this talk, we present some recent results on the asymptotic behavior of codimensions for nonassociative algebras and superalgebras.

Giovanni **Bazzoni**
University of Insubria, Italy

On the classification of nilpotent Lie algebras

Abstract: The classification of nilpotent Lie algebras is a wild problem: there is no hope to solve it in full generality. However, in low dimensions, classification results are possible. For instance, the classification over R and C in dimension at most 6 is classic. Many results are available in dimension 7. The classification over $\mathbb{Q}$ is not as standard, and is of great importance, since it allows us to understand the compact quotients of the corresponding Lie groups. In this talk, we review the aforementioned results and explain certain techniques that allow us to obtain a classification of 8-dimensional 2-step nilpotent Lie algebras over algebraically closed fields of characteristic different from 2 and 3.

Ignacio **Bajo**
University of Vigo, Spain

Lorentz flat metrics on nilpotent and almost abelian Lie algebras

Abstract: A Lorentz metric on a vector space is a non-degenerate symmetric bilinear form of signature $(n-1, 1)$. We study Lie algebras endowed with Lorentz metrics such that the corresponding Levi-Civita product is flat in the sense that it is a left-symmetric product. We give a complete classification of nilpotent Lie algebras and of almost abelian Lie algebras admitting such structures. Moreover, for each of these Lie algebras, we describe the set of inequivalent flat Lorentzian metrics.

Jonas **Deré**
Catholic University of Leuven, Belgium

Nice bases for Lie algebras

Abstract: A basis $\{x_1, \ldots, x_n\}$ for a Lie algebra L is called nice if the structural constants given by

$$[x_i, x_j] = \sum_{k=1}^{n} a_{ij}^k x_k$$

satisfy the following properties:

$$\text{for all } i, j \text{ there exists at most one } k \text{ such that } a_{ij}^k \neq 0;$$
$$\text{for all } i, k \text{ there exists at most one } j \text{ such that } a_{ij}^k \neq 0.$$

This means that each bracket $[x_i, x_j]$ yields at most one non-zero term, and each basis vector appears in at most one bracket for a fixed left argument. These bases have many interesting algebraic and geometric applications; for example Lauret and Will proved that a basis of a nilpotent Lie algebra is stably Ricci-diagonal if and only if it is nice. However, not every Lie algebra has a nice basis, and determining whether a given Lie algebra has such a basis is not always easy. In low dimensions, the nilpotent Lie algebras admitting a nice basis were classified in Conti and Rossi using nice diagrams. In ongoing work, we study the existence and number of non-equivalent nice bases on Lie algebras associated to graphs. These Lie algebras were introduced by Dani and Mainkar and form a well-studied class of examples, which include the free nilpotent Lie algebras.

Kauê **Pereira**
State University of Campinas, Brazil

Regev–Seeman algebras

Abstract: Regev–Seeman algebras were introduced in 2005 by Regev and Seeman. Let R be an associative algebra over an algebraically closed field K of characteristic 0, and consider a decomposition into a direct sum of subspaces

$$R = R_1 \oplus \cdots \oplus R_m.$$

We say that this decomposition is <u>Regev–Seeman regular</u> if the following conditions are satisfied: (1) : For every $n \in \mathbb{N}$ and every $(i_1, \ldots, i_n) \in \{1, \ldots, m\}^n$, there exist elements $r_j \in R_{i_j}$ such that $r_1 \cdots r_n \neq 0$; (2) For all $1 \leq i, j \leq m$, there exists $\varepsilon_{i,j} \in K^*$ (called the <u>quantum factors</u>) such that, $r_i r_j = \varepsilon_{i,j} r_j r_i$. If an associative algebra R admits such a decomposition, we call R a <u>Regev–Seeman algebra</u>. These algebras play an important role in the study of polynomial identities. When the Regev–Seeman decomposition of R arises from a group grading by a finite abelian group G, we say that R is a G-graded regular algebra; in this case, the scalars $\varepsilon_{i,j}$ turn out to form a bicharacter of G. In this talk, we focus on finite-dimensional Regev–Seeman algebras without assuming the existence of an underlying grading. In particular, we present results related to the Bahturin–Regev conjecture concerning the minimality of a Regev–Seeman decomposition and the determinant of the regular decomposition matrix $\mathcal{M} = (\varepsilon_{i,j})_{i,j}$.

Kobiljon **Abdurasulov**
University of Beira Interior, Portugal

σ-matching and interchangeable structures on null-filiform associative algebras

Abstract: We describe σ-matching and interchangeable products and, as a consequence, totally compatible products on null-filiform associative algebras. In addition, we prove the equivalence of id-matching, interchangeable, and totally compatible structures on null-filiform associative algebras.

Manuel **Mancini**
University of Palermo, Italy

On Lie-holomorphs and biderivations of Leibniz algebras

Abstract: In this talk, we study the notion of Lie-holomorph of a Leibniz algebra, recently introduced by N. P. Souris as a generalisation of the classical holomorph construction for Lie algebras. We establish a connection between the Lie-holomorph construction and the Leibniz algebra of biderivations defined by J.-L. Loday, and we show that a linear endomorphism is a Lie-derivation if and only if it is both a derivation and an anti-derivation. Moreover, we provide a classification of the Lie-holomorph algebras of all low-dimensional non-Lie Leibniz algebras over a field of characteristic different from 2. This is joint work with Gianmarco La Rosa (University of Palermo).

Maxime **Fairon**
University of Burgundy Europe, France

Double Poisson vertex algebra cohomology

Abstract: A Poisson vertex algebra (PVA) is a differential commutative associative algebra endowed with a Poisson-like structure. The structure of a double Poisson vertex algebra (dPVA) was introduced by De Sole, Kac, and Valeri in order to induce a PVA structure on each of its representation algebras. For PVAs, several cohomology theories have been constructed by De Sole and Kac, where some equivalences can be obtained. Analogous constructions for dPVAs are now available and can be computed in the case of non-degenerate constant 2-fold λ-brackets. Furthermore, it can be shown that this new setting is compatible with its commutative counterpart by application of the representation functor. My aim is to give a quick recap of the cohomologies available for PVAs, before delving in the case of dPVAs. Time allowing, I may also explain the compatibility of these theories with the (double) Poisson algebra cohomology under the jet functor. This talk is meant to be an overview of Parts 2 and 3 of arXiv:2509.21232, joint with Daniele Valeri (La Sapienza, IT).

Nicolas **Gilliers**
Paris Cité University, France

Non-associative structures in non-commutative probability

Abstract: I will underline a post-Lie theoretic interpretation of a relation pertaining to free probability theory and more specifically to the free multiplicative convolution of operator-valued distributions. In my talk, I will develop the notions of post-group, compatible post-groups, and the newly introduced object: the Guin-Oudom group. We will see how they can help classify multiplicatively infinitely divisible operator-valued distributions (work in progress).

Paola **Stefanelli**
University of Salento, Italy

On di-skew braces and solutions of the set-theoretic Yang–Baxter equation

Abstract: The Yang-Baxter equation (YBE) is a fundamental equation of mathematical physics that has been extensively studied over the past three decades. Its set-theoretic version of the YBE, originating from a paper by Drinfeld in 1992, has since become an important source of new algebraic structures. In this context, bijective and non-degenerate solutions of the YBE are closely connected to groups, racks, skew braces, and their various generalizations. In this talk, we introduce new algebraic structures, called di-skew braces, and show that they provide bijective and non-degenerate set-theoretic solutions of the YBE. In particular, generalized digroups systematically yield such solutions via di-skew braces. We further focus on the associated left-derived shelves that are examples of conjugation racks. As a consequence, we prove that the solutions obtained by di-skew braces belong to a broader class that contains skew braces solutions. This is joint work with A. Albano.

Raschid **Abedin**
University of Hamburg, Germany

Quantum groups from double quotients

Abstract: I will present a method to construct quantum groups and quantum groupoids from double quotients of groups and their actions. In particular, one can construct an analog of the Yangian, a well-known quantum group which is associated to a semisimple Lie algebra, for cotangent Lie algebras in this way. This construction is motivated by Hecke patterns that appear in the geometric Langlands correspondence.

Sebastiano **Argenti**
Memorial University of Newfoundland, Canada

Gradings on finite dimensional algebras

Abstract: Describing the gradings of an algebra usually means solving the following two problems: classifying the fine gradings up to equivalence and, for a fixed group G, classifying the G-gradings up to isomorphism. These classifications have been obtained for several classes of algebras, thanks to the efforts of many people, using a multitude of methods tailored specifically for each case. In recent years, methods and algorithms have been developed that are generally applicable to any finite dimensional algebra.

Thiago **Castilho de Mello**
Federal University of São Paulo State University, USA

Non-matrix varieties of associative rings

Abstract: A variety of algebras is called nonmatrix if it does not contain the algebra of 2×2 matrices. This notion was first introduced by Latyshev and later studied by Kemer and Ciekanu, who established several equivalent conditions for this property. More recently, Mischenko, Petrogradsky, and Regev obtained further equivalences in the case of algebras over fields of characteristic zero.

In this talk, we present new equivalent conditions for a variety to be nonmatrix and show that several known results can be extended to the more general setting of algebras over commutative unital rings, rather than fields. This is joint work with F. Yasumura.

Tomasz **Brzeziński**
Swansea University, UK

On Lie affgebras

Abstract: The notion of a Lie affgebra was first introduced by Grabowska, Grabowski and Urbański in 2003 as an affine space with a bi-affine operation whose linearised counterpart satisfies the antisymmetry and Jacobi identities. This notion was refined by the speaker and his collaborators, Andruszkiewicz, Papworth, and Radziszewski about twenty years later in a way that does not require any reference to a (tangent) vector space. In this talk, I will discuss the definition and main properties and examples of Lie affgebras and put them in a more general framework of affinization understood as an attempt to formulate and analyse (additive or linear) algebraic structures in a way in which no selection of a specific element or a tangent vector space is necessary.

Vicent **Pérez Calabuig**
University of Valencia, Spain

On solubility of skew braces and solutions of the Yang-Baxter equation

Abstract: In our previous work on soluble skew braces and soluble solutions of the Yang-Baxter equation, solubility of solutions was introduced as an extension of solubility of skew braces in the classification context of non-degenerate solutions of the Yang-Baxter equation. One of our main results (Theorem C) proved that a skew brace is soluble if, and only if, its associated solution is soluble. A minor step depending on the definition of homomorphism of solutions was overlooked. In this presentation, we revisit our previous definition of soluble solutions in terms of what we call i-homomorphisms of solutions. This new class of homomorphisms turns out to be essential to understand indecomposable solutions, as i-simplicity proves to be equivalent to indecomposability. This equivalence naturally leads to introduce solubility of solutions as an opposite class of indecomposable solutions. The results obtained with this definition improve our previous outcomes: every soluble solution is proved to have a soluble skew brace structure, and consequently, Theorem C still holds. Further consequences are also presented. This is joint work with A. Ballester-Bolinches, R. Esteban-Romero and P. Jiménez-Seral.

Yuri **Bakhturin**
Memorial University of Newfoundland, Canada

Finite Algebras

Abstract: I will talk about the new results on the structure and identical relations of finite non-associative algebras.