



AL04

Non-Associative Algebras and Applications

Álgebras No Asociativas y Aplicaciones

Organizers

Alberto Daza García

(Universidad de Sevilla)

Organizadores

Xabier García Martínez

(Universidade de Vigo)

Antolatzaileak

Andrés Pérez Rodríguez

(Universidade de Santiago de Compostela)

Description

The study of non-associative algebras naturally appears in numerous areas of mathematics. Historically, it was mainly represented by Lie algebras and Jordan algebras, providing methods in differential geometry, differential equations, and physics. Currently, it encompasses a multitude of research lines, such as evolution algebras (aimed at modeling non-Mendelian genetics), operads and their connection with algebraic topology, superalgebras, and more.

In this session, we will bring together a group of pre- and post-doctoral researchers with the goal of fostering collaborations and introducing the mathematical community to the topics in this area and their interactions.

Descripción

El estudio de álgebras no asociativas aparece de manera natural en multitud de áreas de las matemáticas. Históricamente estaba representado principalmente por las álgebras de Lie y las álgebras de Jordan, proporcionando métodos en geometría diferencial, ecuaciones diferenciales y física. Actualmente, cuenta con multitud de líneas de estudio, como las álgebras de evolución (con el objetivo de modelar la genética no-Mendeliana), las operadas y su conexión con la topología algebraica, las superálgebras, etc.

En esta sesión reuniremos a un grupo de investigadores pre y post doctorales con el objetivo de fomentar colaboraciones y dar a conocer a la comunidad matemática los temas de esta área y sus interacciones.

Deskribapena

MSC Codes**Códigos MSC****MSC Kodeak**

17-XX

(primary)

15B30; 17BXX; 18-XX

(secondary)

Slots**Bloques****Blokeak**

2.A (Aula 0.2); 2.B (Aula 0.2); 2.C (Aula 0.2)

QR Code**Código QR****QR Kodea****Session Schedule****Horario de la Sesión****Saioaren Ordutegia**

J16 | 11:00-11:20 | 0.2

*Gradings on associative triple systems***Alberto Daza Garcia** (Universidad de Sevilla)

J16 | 11:30-11:50 | 0.2

*Short $SL_2 \times SL_2$ -structures on Lie algebras***Alejandra Sarina Córdova Martínez** (Universidad de Málaga)

J16 | 12:00-12:20 | 0.2

*Some results on compatible Lie algebras***Bernardo Leite da Cunha** (Universidade de Santiago de Compostela)

J16 | 12:30-12:50 | 0.2

*Twisted Lie algebras***Francisco de Paula Cuenca Carrégalo** (Universidad de Málaga)

J16 | 16:30-16:50 | 0.2

Quadratically defined Lie algebras and HNN-extensions

Simone Blumer (University of Vienna)

J16 | 17:00-17:20 | 0.2

Double-double extension of quadratic Lie algebras

Javier Rández Ibáñez (Universidad de La Rioja)

J16 | 17:30-17:50 | 0.2

Skew-adjoint endomorphisms and generalized oscillator Lie algebras

Jorge Roldán-López (Universidad de La Rioja)

J16 | 18:00-18:20 | 0.2

On Loday-Pirashvili Category

Alejandro Fernández Fariña (Universidade de A Coruña)

V17 | 9:00-9:20 | 0.2

Centroid and algebraic properties of evolution algebras through graphs

Iván Ruiz Campos (Universidad de Málaga)

V17 | 9:30-9:50 | 0.2

Gonosomal algebras and operators

Andrés Pérez Rodríguez (Universidade de Santiago de Compostela)

Thursday 16

11:00-11:20

[Room 0.2]

Jueves 16

11:00-11:20

[Aula 0.2]

Osteguna 16

11:00-11:20

[Gela 0.2]

Gradings on associative triple systems

Alberto Daza Garcia

(Universidad de Sevilla)

Associative triple systems of the second kind is a nonassociative structure which acts as a bridge between structurable algebras related to an hermitian form and some 3-graded associative algebras with an involution. In this talk we explain how do we classify all gradings on associative triple systems.

[arXiv:2403.13775](https://arxiv.org/abs/2403.13775)

Thursday 16

11:30-11:50

[Room 0.2]

Jueves 16

11:30-11:50

[Aula 0.2]

Osteguna 16

11:30-11:50

[Gela 0.2]

Short $SL_2 \times SL_2$ -structures on Lie algebras

Alejandra Sarina Córdoba Martínez

(Universidad de Málaga)

To generalise the notion of gradings by abelian groups Vinberg introduced the S-structures, where the S stands for a reductive group. Some research has been made on such structures for simple reductive groups. In this talk short($SL_2 \times SL_2$)-structures are shown to be used to cover a situation where the reductive group is the simplest semisimple but not simple reductive group.

Joint work with Patricia D. Beites, Isabel Cunha and Alberto Elduque.

[arXiv:2303.17993](https://arxiv.org/abs/2303.17993)

Thursday 16

12:00-12:20

[Room 0.2]

Jueves 16

12:00-12:20

[Aula 0.2]

Osteguna 16

12:00-12:20

[Gela 0.2]

Some results on compatible Lie algebras

Bernardo Leite da Cunha

(Universidade de Santiago de Compostela)

Given two Lie products on a vector space, they are said to be compatible if any linear combination of them is also a Lie product. We start with some basic definitions and results which are analogous to those of Lie algebras. Then, we explore the more complex notions such as nilpotency, solvability, semisimplicity and cohomology of compatible Lie algebras, highlighting the results that are analogous to the non-compatible case and those that differ significantly.

Joint work with Manuel Ladra and Samuel Lopes.

[arXiv:2406.04036](https://arxiv.org/abs/2406.04036)

Thursday 16

12:30-12:50

[Room 0.2]

Jueves 16

12:30-12:50

[Aula 0.2]

Osteguna 16

12:30-12:50

[Gela 0.2]

Twisted Lie algebras

Francisco de Paula Cuenca Carrégalo

(Universidad de Málaga)

The compact simple Lie algebra \mathfrak{g}_2 admits a nice model as a "twisted ring group". We ask whether there are more Lie algebras that fit this structure or, on the contrary, the case of \mathfrak{g}_2 is an isolated example. We will show that there is an interesting collection of unknown solvable and nilpotent Lie algebras, obtained by graded contractions on the orthogonal Lie algebras of dimension 7 and 8, that can be described in this way.

Joint work with Cristina Draper Fontanals.

Thursday 16

16:30-16:50

[Room 0.2]

Jueves 16

16:30-16:50

[Aula 0.2]

Osteguna 16

16:30-16:50

[Gela 0.2]

Quadratically defined Lie algebras and HNN-extensions

Simone Blumer

(University of Vienna)

In this talk, we will delve into the class of Lie algebras defined by quadratic relations, investigating how their cohomology rings can be explicitly computed in certain cases. The theory of HNN-extensions plays a crucial role in this context, providing a powerful tool for decomposing these Lie algebras into smaller components. Moreover, we will explore how HNN-extensions can be used to embed finitely presented positively graded Lie algebras into quadratic ones.

Thursday 16

17:00-17:20

[Room 0.2]

Jueves 16

17:00-17:20

[Aula 0.2]

Osteguna 16

17:00-17:20

[Gela 0.2]

Double-double extension of quadratic Lie algebras

Javier Rández Ibáñez

(Universidad de La Rioja)

The class of quadratic Lie algebras is broad and challenging to classify. Lorentzian algebras, those with Witt index equal to 1, can be classified using the double extension method (Medina and Revoy, 1985) starting from an orthogonal vector space (Benito et al., 2024). The next natural step involves quadratic Lie algebras with Witt index equal to 2. This class can be constructed by means of two double extensions, and we attempt to classify the algebras in the class from this perspective.

Joint work with Pilar Benito and Jorge Roldán-López.

[arXiv:2401.03100](https://arxiv.org/abs/2401.03100)

Thursday 16

17:30-17:50

[Room 0.2]

Jueves 16

17:30-17:50

[Aula 0.2]

Osteguna 16

17:30-17:50

[Gela 0.2]

Skew-adjoint endomorphisms and generalized oscillator Lie algebras

Jorge Roldán-López

(Universidad de La Rioja)

This talk focuses on skew-adjoint endomorphisms and their role in constructing quadratic Lie algebras. We are introducing generalized oscillator algebras, which arise from double extensions of abelian Lie algebras by skew-adjoint derivations. Later, we will proceed to the classification of oscillator nilpotent algebras and those with quadratic dimension 2 recovering the classification of real oscillator algebras, also known as Lorentzian algebras.

Joint work with Pilar Benito and Javier Rández-Ibáñez.

[arXiv:2401.03100](https://arxiv.org/abs/2401.03100)

Thursday 16

18:00-18:20

[Room 0.2]

Jueves 16

18:00-18:20

[Aula 0.2]

Osteguna 16

18:00-18:20

[Gela 0.2]

On Loday-Pirashvili Category

Alejandro Fernández Fariña

(Universidade de A Coruña)

In 1998, Loday and Pirashvili they equipped the category LM of linear maps of vector spaces with a tensor product, constructing the Loday-Pirashvili category. This tensor product allows them to do various constructions related to Leibniz algebras; in this monoidal category, a Leibniz algebra becomes a Lie object. In this talk we will introduce this category and show that its construction can be done for categories other than vector spaces asking for some conditions that are not very restrictive.

Friday 17
9:00-9:20
[Room 0.2]

Viernes 17
9:00-9:20
[Aula 0.2]

Ostirala 17
9:00-9:20
[Gela 0.2]

Centroid and algebraic properties of evolution algebras through graphs

Iván Ruiz Campos

(Universidad de Málaga)

The aim of this talk is linking algebraic properties of an evolution algebra with combinatorial properties of the graphs that one can associate. We also provide a description of the prime ideals and prove that certain algebraic properties, such as semiprimeness and perfection, can not be characterized in combinatorial terms. In addition, we describe the centroid of evolution algebras as constant functions along the connected components of its associated graph.

Joint work with Yolanda Cabrera Casado, Daniel Gonçalves, Maria Inez Gonçalves Cardoso, Dolores Martín Barquero, and Cándido Martín González.

[arXiv:2404.08752](https://arxiv.org/abs/2404.08752)

Friday 17
9:30-9:50
[Room 0.2]

Viernes 17
9:30-9:50
[Aula 0.2]

Ostirala 17
9:30-9:50
[Gela 0.2]

Gonosomal algebras and operators

Andrés Pérez Rodríguez

(Universidade de Santiago de Compostela)

The main objective of this talk is to make a brief approach to gonosomal algebra theory. Gonosomal algebras were introduced with the purpose of modelling a wide variety of sex determination systems observed in bisexual populations. We will comment on some of the numerous constructions and examples presented in R. Varro's *Gonosomal algebra* and study their dynamics by constructing the associated gonosomal operator.

Joint work with Yolanda Cabrera Casado and Manuel Ladra.