

PROPOSTA DA SESSÃO TEMÁTICA

Álgebra

1 Identificação

Título da Sessão Temática: Álgebra

Coordenadores

Nome: Prof. Claudemir Fidelis

Nome: Prof. Pietro Speziali

2 Formato e Palestrantes

A duração de cada palestra será de 20 (trinta) minutos. Com isso, temos 11 (onze) palestrantes. A seguir a lista dos palestrantes:

1. Prof. Felipe Yukihide Yasumura (IME-USP)

Status: Confirmado

Título e resumo da palestra:

Group gradings on exceptional simple Lie superalgebras

In this presentation, we will introduce some concepts related to the theory of graded algebras, with a particular emphasis on the duality between group gradings and actions. Then, we will discuss recent results by Elduque and Kochetov, which relate the classification of isomorphism classes of group gradings on a given algebra to their equivalence classes of fine gradings.

By combining these results with the classification of equivalence classes of fine gradings on the exceptional simple Lie superalgebras by Draper et al. (2011), we are able to determine the isomorphism classes of group gradings on the same algebras.

This is joint work with Mikhail Kochetov (Memorial University, Canada) and Sebastiano Argenti (University of Basilicata, Italy). Supported by Fapesp, grant 2023/03922-8 and 2018/23690-6.

2. Prof. Kostiantyn Iusenko (IME-USP)

Status: Confirmado

Título e resumo da palestra:

A relative homology criteria of smoothness

Smoothness is a fundamental concept in algebraic geometry, providing a key link between the geometric and algebraic properties of varieties. A fundamental result, due to Auslander-Buchsbaum and Serre, asserts that if V is an affine algebraic variety over a perfect field k with coordinate ring A , then the global dimension of A is finite if and only if V is smooth. Instead of considering a map $k \rightarrow A$, one can generalize this result by replacing k with a commutative ring B . A well-established criterion for smoothness in this case has several homological characterizations. In this talk, we provide a characterization of smoothness via relative global homology, developed by Hochschild, specifically focusing on the relative global dimension

$\text{gldim}(A, B)$. We prove that if k is a perfect field, B is a finitely generated k -algebra, and A is a flat Noetherian B -algebra, locally of finite type, then the map $B \rightarrow A$ is smooth if and only if $\text{gldim}(A, B)$ is finite. This talk is based on joint work with Eduardo Marcos and Victor Pretti.

3. Prof. Victor Hugo Jorge Perez (ICMC-USP)

Status: Confirmado

Título e resumo da palestra:

Advances on the Auslander-Reiten Conjecture and Homological Algebra

In this talk, we will present recent progress on the Auslander-Reiten conjecture for finitely generated modules over Noetherian rings. First, we will provide a brief introduction to the basic concepts of homological algebra needed to understand the conjecture. Then, we will discuss the new results obtained on this topic.

4. Prof. Flavio Ulhoa Coelho (IME - USP)

Status: Confirmado

Título e resumo da palestra:

On generalized path algebras

The underlined idea behind the concept of generalized path algebras, as introduced in [5], is the following. Given a quiver Q and a field k , assign to each of its vertex x a finite dimensional k -algebra A_x (in the classical case of path algebra, it is assigned the base field k). Then the multiplication is induced by composition of paths and multiplication inside the algebras A_x . Also, as in the classical case, we can consider relations in the quiver and define the so-called generalized bound path algebras. An algebra $A = kQ_A/I_A$ (where Q_A is a quiver and I_A is an admissible ideal of kQ_A) can naturally be seen as a generalized bound path algebras in two different ways. For one hand, using the quiver Q_A and the usual construction of path algebras, and, on the other, using a quiver with a sole vertex and no arrows and the algebra itself assigned to it. We shall call these ways of representing A as generalized bound path algebras as **trivial**. A question which naturally arises is on the possibility of having descriptions other than the above ones for A . Clearly, if this is possible, then to A we shall assign a quiver (generally smaller than its Gabriel quiver) and a set of algebras, one for each vertex of this new quiver, and this might, in principle, allow us to better understand the original algebra. This will be the first question discussed in this talk. Also, we shall discuss the representations of a generalized bound path algebra in terms of the representations of the algebras used in its constructions. Finally, from the description of projective and injective modules, we shall look at some of its homological invariants. We base our talk on a joint work with Viktor Chust [1, 2, 3, 4].

Project financed by FAPESP, number 2022/02403-4.

Referências

- [1] Chust, V., Coelho, F. U., *On the correspondence between path algebras and generalized path algebras*, Comm. Algebra **50**:5 (2022), 2056-2071. arXiv: 2112.12189.
- [2] Chust, V., Coelho, F. U., *Representations of Generalized Bound Path Algebras*, São Paulo J. Math. Sci. **17** (2023), 483-504. arXiv: 2112.12174.
- [3] Chust, V., Coelho, F. U., *Homological invariants of generalized bound path algebras*, preprint. arXiv: 2207.09488.
- [4] Chust, V., Coelho, F. U., *A note on the representation type of generalized path algebras*, preprint. arXiv: 2501.04123.

- [5] Coelho, F. U., Liu, S.X, *Generalized path algebras in: Interaction between ring theory and representations of algebras. Proceedings of the conference held in Murcia, Spain. 53–66, Lecture Notes in Pure and Appl. Math., 210, Dekker, New York, 2000.*

5. Prof. Renato Vidal Martins (UFMG) Status: Confirmado

Título e resumo da palestra: **Stability conditions for coherent systems on integral curves**

In this talk, we briefly introduce stability conditions, which we apply to the category of coherent systems on an integral curve C . We define Bridgeland stability conditions on its derived category. By studying semistable objects, we get some results concerning bounds for the dimension of the space of global sections of torsion-free sheaves on C in terms of their rank and degree. It's a joint work with Marcos Jardim and Leonardo Roa-Leguizamon

6. Prof. Dimas José Gonçalves (DM-UFSCar)

Status: Confirmada

Título e resumo da palestra:

Identidades polinomiais graduadas para a álgebra de Lie das matrizes triangulares superiores de ordem 2

Considere a álgebra de Lie das matrizes triangulares superiores de ordem 2, sobre um corpo qualquer, cuja operação de multiplicação é o colchete induzido pela operação de multiplicação associativa usual. Nesta palestra será apresentada uma base para as identidades polinomiais graduadas de tal álgebra Lie com respeito a toda graduação por um grupo. Este trabalho foi realizado em conjunto com Evandro Riva, e contou com apoio da Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Processo nº 2018/23690-6.

7. Prof. Gilson Reis dos Santos Filho (IME-USP)

Status: Confirmada

Título e resumo da palestra:

Finitude local de coálgebras em variedades de álgebras de Jordan não-comutativas

O objetivo deste trabalho é investigar a propriedade da finitude local sobre coálgebras de Jordan não-comutativas. A variedade das álgebras de Jordan não comutativas contém as álgebras anticomutativas, álgebras alternativas, álgebras de Jordan, entre outras. Por conta da diversidade de álgebras contidas nesta variedade, convém adotar alguma restrição sobre o escopo de estudo. I. Shestakov conjectura que a propriedade da finitude local é válida para coálgebras de uma variedade se, e somente se, esta variedade admite radical localmente nilpotente. Motivados por esta conjectura, restringimos o estudo da questão da finitude local a duas classes de variedades de álgebras de Jordan não-comutativas: a classe das variedades admissíveis e classe das variedades localmente admissíveis. Sabe-se que variedades destas classes sempre admitem radical localmente nilpotente.

Nesta apresentação mostraremos um critério suficiente para que coálgebras de uma variedade sejam localmente finitas e aplicamos este critério para mostrar que coálgebras de uma variedade admissível são sempre localmente finitas. Também aplicamos este critério para exibir dois exemplos de variedades não-admissíveis cujas coálgebras também tem a propriedade da finitude local. Por fim, discutimos como o critério pode auxiliar a resolver o problema de determinar a propriedade da finitude local para outras classes.

Este trabalho foi feito em conjunto com os professores Lucia Murakami (IME-USP) e Ivan Shestakov (IME-USP).

8. Prof. Thiago Castilho (ICT-UNIFESP)

Status: Confirmado

Título e resumo da palestra:

Identities of relatively free algebras of Lie nilpotent associative algebras

In this talk we consider the relatively free algebra of rank m , $F_m(\mathfrak{N}_p)$, in the variety of Lie nilpotent associative algebras of index $p + 1$, denoted by $\mathfrak{N}_p$, over a field of characteristic zero. We describe an explicit minimal basis for the polynomial identities of $F_m(\mathfrak{N}_p)$ when $p = 3$ and $p = 4$, for all m , except for $F_3(\mathfrak{N}_4)$. In the general case, we present an upper bound of the minimal k such that $[x_1, x_2] \cdots [x_{2k-1}, x_{2k}]$ is an identity for $F_m(\mathfrak{N}_p)$.

This is a joint work with Elitza Hristova.

Supported by São Paulo Research Foundation (FAPESP), Brazil, process number 2018/23690-6

9. Roberto Carlos Alvarenga da Silva Júnior (IBILCE-UNESP)

Status: Confirmado

Título e resumo da palestra:

On Hecke modifications and parabolic structures

Resumo: In this talk, we discuss a connection between Hecke modifications and the (quasi-)parabolic structure of a vector bundle. For rank 2 vector bundles, this connection is well known and has been widely used to study moduli problems. Our main focus will be on discussing this connection for higher rank vector bundles and at the level of stacks.

10. Prof. Mikhailo Dokuchaev (IME-USP)

Status: Confirmado

Título e resumo da palestra:

Spectral sequences converging to the Hochschild homology and cohomology of crossed products by unital actions of inverse monoids and Steinberg algebras

Given a unital action of an inverse monoid S on an algebra A and a bimodule M over the crossed product $A *_\theta S$, we construct a (co)homology Grothendieck spectral sequence which converges to the Hochschild (co)homology of $A *_\theta S$ with values in M . The spectral sequence involves the (co)homology of S and the Hochschild (co)homology of A , when applied to unital Steinberg algebras over a field and also in the case of an E -unitary S . Moreover, in the case of a Steinberg algebra, the homology spectral sequence collapses on p -axis, resulting in an isomorphism of homology groups.

This is a joint work with Mykola Khrypchenko and Juan Jacobo Simón.

11. Prof. Pedro Souza Fagundes (DM-UFSCar)

Status: Confirmado

Título e resumo da palestra:

Álgebras que são somas de PI álgebras

Nesta palestra iremos discutir o seguinte problema: quando a soma de duas PI álgebras ainda é uma PI álgebra? Esta pergunta foi feita por Beidar and Mikhalev em 1995 e apenas respondida (positivamente) por Kępczyk 21 anos depois. Além de discutirmos a história por trás deste problema, iremos mostrar que a versão graduada do mesmo não apresenta uma resposta positiva em geral. Além disso, apresentaremos condições suficientes para que a soma de duas subálgebras homogêneas gr-PI ainda satisfaça alguma identidade polinomial graduada. Este trabalho foi realizado com o apoio da FAPESP, Processo nº 2019/16994-1 e Processo nº 2022/05256-2.