Manhãs de Matemática na AbERTA

#02. ÁLGEBRA

29 de maio de 2023
Auditório III, Palácio Ceia, Lisboa

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A participação presencial é livre mas requer inscrição enviando email para: **fcosta@uab.pt**

HORA	ORADOR	TÍTULO
9h45–10h30	Pedro Resende (IST-UL)	Uma abordagem matemática ao problema da medição em mecânica quântica
10h30–11h15	Ana Luísa Correia (AM-IUM)	On approaching Rees algebras of modules
11h15–11h40	*COFFEE BREAK*	
11h40–12h25	Tânia Silva (FC-UL)	A Schur ring approach to supercharacters of groups associated with finite radical rings
12h25–13h10	Wolfram Bentz (UAb)	How commutative are non-commutative semigroups?

Uma abordagem matemática ao problema da medição em mecânica quântica

Pedro Resende (Instituto Superior Técnico e CAMGSD, Univ. de Lisboa)

Abstract: O problema da medição é um dos mistérios conceptuais da física contemporânea, que tem desafiado gerações de físicos desde a descoberta da mecânica quântica no início do século XX e levado ao surgimento de diversas interpretações e propostas de modificação da mecânica quântica que no entanto ainda carecem de verificação experimental. Nesta palestra descrevo uma abordagem ao problema baseada numa noção de espaço cujos elementos são medições abstractas. O intuito é sugerir que o problema também é matemático, além de conceptual, e mostrarei como surgem naturalmente na teoria diversos elementos de topologia sem pontos.

On approaching Rees algebras of modules

Ana Luísa Correia (Academia Militar e CINAMIL, Instituto Univ. Militar e CEAFEL, Univ. de Lisboa)

Abstract: Rees algebras of an ideal may be seen as a coordinate ring of a projective variety, and it plays an important role in the study of algebraic singularities. Several parts of their theory can be extended to the cases of filtrations ideals or modules, and multi-Rees rings, which correspond to the case where the module is a direct sum of ideals.
In studying Rees algebras of modules, and related concepts such as reductions or integral closures, various ideals can be attached to a module. In this talk, we will review some of these ideals and explain how they are used as tools to develop the theory of Rees algebras of modules.

A Schur ring approach to supercharacters of groups associated with finite radical rings

Tânia Silva (Faculdade de Ciências e CEAFEL, Univ. de Lisboa)

Abstract: Following [1], we consider the central Schur ring associated with the standard supercharacters of the adjoint group $G(A)$ of a finite radical ring A, and define supercharacters of the subgroup $C_{G(A)}(\sigma)$ consisting of elements fixed by an involution of G that can be defined when A is endowed with an (anti)involution and has odd characteristic. In particular, we extend known results for unipotent subgroups of the classical finite Chevalley groups that can be found in [2].
This is joint work with Carlos André and Pedro J. Freitas (Univ. Lisboa).

[1] Hendrickson A. O. F., Supercharacter theory constructions corresponding to Schur ring products, Communications in Algebra, **40** (12), (2012) 4420–4438.

[2] André C. A. M., Freitas P. J., Neto A. M., A supercharacter theory for involutive algebra groups, Journal of Algebra, **430**, (2015) 159–190.

How commutative are non-commutative semigroups?

Wolfram Bentz (Univ. Aberta e CMA, Univ. Nova de Lisboa)

Abstract: A semigroup is a set with an assocative binary operation, usually written multiplicatively. For this talk, we only consider finite semigroups. Two elements a, b of a semigroup commute if $ab = ba$, and the semigroup is commutative if all pairs of elements commute. An element is central if it commutes with all other elements. Our research is concerned with how to quantify the amount of commutativity in a non-commutative semigroup, and how commutating elements relate to the rest of the structure.
A simple measure of commutativity is the size of the largest commutative subsemigroup. In 1989, Burns and Goldsmith classified all maximum order abelian subgroups of a finite symmetric groups $\mathrm{Sym}(X)$. In this talk,

we show how we obtained the corresponding result in a natural family of semigroups. As it turns out, this relatively simple concept already introduces a large amount of combinatorial complexity.
For more advanced results, we use a structure that encodes the degree of commutativity in a semigroup S, called the commuting graph of S. It is a simple graph whose vertices are the non-central elements of S, where two distinct vertices x, y are adjacent if $xy = yx$. We examine graph-theoretic properties of the graph in order to study the original semigroups.
As an example, we will specifically address results about the diameter of the graph. This is a number that can be interpreted as a measure for how efficiently commutating elements connect the semigroup. We close by providing some open, but accesible problems about commutativity in semigroups.
This is joint work with João Araújo (Universidade Nova) and Janusz Konieczny (Mary Washington).