

CATEGORY THEORY RESEARCH SEMINAR:

A Universal Kaluzhnin–Krasner Embedding Theorem

Prof Xabier García Martínez (CITMAga & University of Vigo, Spain)

DATE: Thursday, 20 February 2025 | 15h00 – 16h00 SAST

VENUES:

- Room 1006, Mathematical Sciences and Industrial Psychology Building, Stellenbosch University
- Online – at <https://bit.ly/433QdQv>

ABSTRACT

Given two groups A and B , the *Kaluzhnin–Krasner universal embedding theorem* states that the wreath product $A \wr B$ acts as a universal receptacle for extensions from A to B . For a split extension, this embedding is compatible with the canonical splitting of the wreath product, which is further universal in a precise sense. This result was recently extended to Lie algebras and cocommutative Hopf algebras. In this talk we will explore the feasibility of adapting the theorem to other types of algebraic structures. By explaining the underlying unity of the three known cases, our analysis gives necessary and sufficient conditions for this to happen. We will also see that the theorem cannot be adapted to a wide range of categories, such as loops, associative algebras, commutative algebras or Jordan algebras. Working over an infinite field, we may prove that amongst non-associative algebras, only Lie algebras admit a Kaluzhnin–Krasner theorem.

References:

- [1] L. Bartholdi, O. Siegenthaler, T. Trimble (2014). Wreath products of cocommutative Hopf algebras. arXiv:1407.3835.
- [2] B. S. Deval, X. García-Martínez, T. Van der Linden (2024). Proceedings of the American Mathematical Society, 152(12), 5039–5053, 2024.
- [3] M. Krasner, L. Kaloujnine (1950). Produit complet de groupes de permutations et problème d'extension de groupes II. Acta Universitatis Szegediensis, 14, 69–82.
- [4] V. M. Petrogradsky, Yu. P. Razmyslov, E. O. Shishkin (2007). Wreath products and Kaluzhnin–Krasner embedding for Lie algebras. Proceedings of the American Mathematical Society, 135(3), 625–636.

BIOGRAPHY

Xabier García Martínez is an Associate Professor (Profesor Titular) at the University of Vigo and a researcher at CITMAga. He is the Principal Investigator of the project '*Algebraic Methods in Geometry and Geometric Methods in Algebra*' (PID2021-127075NA-I00).

WHO SHOULD ATTEND?

All are welcome. It will be assumed that the audience is familiar with basic concepts of category theory.



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