JORDAN TYPE OF AN ARTINIAN ALGEBRA PHD THESIS PROJECT

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Plan. The Jordan type of a nilpotent element ℓ of an Artinian algebra A is the partition giving the sizes of the Jordan blocks of the multiplication map $\times \ell : A \to A$. When A is a graded algebra, Jordan type is a finer invariant than the Lefschetz properties, and allows the extension of the definition of these properties to non-graded algebras. A good acount on the subject can be found in [IMMM22] and [AIMM24].

There is a good variety of open questions on Jordan type that can be tackled in a PhD project. Motivating questions may be to find a good definition of *relative strong Lefschetz* when the Hilbert function of a graded Artinian algebra is not unimodal (i.e. increases after having decreased), or to understand the behaviour of Jordan type with respect to short exact sequences of modules or tensor products of algebras.

Student profile. The candidate should have a minimum background of a one-semester course in commutative algebra.

References

- [AIMM24] Nasrin Altafi, Anthony Iarrobino, and Pedro Macias Marques, Jordan type of an Artinian algebra, a survey, arXiv:2307.00957, to appear in "Lefschetz Properties: Current and New Directions", Springer INdAM Series, 2024.
- [IMMM22] Anthony Iarrobino, Pedro Macias Marques, and Chris McDaniel, Artinian algebras and Jordan type, Journal of Commutative Algebra 14 (2022), no. 3, 365–414.