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Polynomiality of faithful dimension of finite p-groups parametrized by finite truncated valuation rings

The faithful dimension of a finite group G is the smallest dimension of a faithful representation of G. It is a notion closely related to the concept of essential dimension of G, introduced by Buhler and Reichstein. In this talk we present polynomiality results for the faithful dimension of finite p-groups associated (through the Lazard correspondence) to Lie algebras of the form  $\mathfrak{g} \otimes_{\mathbb{Z}} R$ , where  $\mathfrak{g}$  is a nilpotent Lie ring and R is a finite truncated valuation ring (e.g., a quotient of the form  $\mathcal{O}/\mathfrak{p}^n$  where  $\mathcal{O}$  is the ring of integers of a p-adic field). We also discuss some connections with model theory and a question about the number of solutions of equations over such rings. This is based on joint work with M. Bardestani and K. Karai.