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Weight modules over classical infinite-dimensional Lie algebras

Simple weight modules with finite-dimensional weight spaces over reductive Lie algebras were classified by Fernando and Mathieu. In this talk I will discuss analogs of this classification for the classical infinite-dimensional Lie algebras A_∞, B_∞, C_∞, and D_∞. There are several new features that distinguish the infinite-dimensional case from the finite-dimensional one. For example, the analog of the Fernando–Futorny parabolic induction theorem fails to hold. Nevertheless, a complete classification can be obtained for modules satisfying mild additional conditions. A prominent role in this classification is played by the so called pointed weight modules, i.e., modules with one-dimensional weight spaces only. The description of all simple pointed modules is derived from the results of Benkart, Britten, and Lemire about pointed modules over simple finite-dimensional Lie algebras.