Theory and Computation in Algebra and Algebraic Geometry

with a dedication to Paolo Valabrega on the occasion of his 70(+2)th Birthday

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Computing resolutions and Betti numbers of polynomial modules

Werner Seiler

Universität Kassel

We will discuss some recent approaches on explicitly computing free resolutions and bigraded Betti numbers of polynomial ideals or modules using ideas originating in the theory of involutive bases and algebraic discrete Morse theory. We will unify these approaches by introducing the combinatorial notion of a resolving decomposition of a polynomial module. We will briefly comment on applications of these results in algebraic geometry (Veronese subrings and Quot schemes, resp.).