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Eigenvalues of Symmetric Matrices over Integral Domains

Abstract: Given an integral domain A we consider algebraic integers over A that can appear as Eigenvalue of a symmetric matrix over A . We address the question of characterizing those algebraic integers as well as the problem of finding the smallest possible size of the corresponding symmetric matrix. The focus will lie on the case where A is the polynomial ring over the real numbers or the ring of integers in an algebraic number field. This has implications on the size of semidefinite programs and on multiplicities of Eigenvalues of graphs.