PRIMARY DECOMPOSITIONS OF IDEALS ARISING FROM HANKEL MATRICES

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Hankel matrices have many applications in various fields ranging from engineering to computer science. Their internal structure gives them many special properties. In this presentation we focus on the structure of the set of polynomials generated by minors of generalized Hankel matrices whose entries consist of indeterminates with coefficients from a field k. A generalized $n \times m$ Hankel matrix M has in its j^{th} codiagonal constant multiples of a single variable X_j. Consider now the ideal $I_r(M)$ in the polynomial ring $k[X_1, \ldots, X_{m+n-1}]$ generated by all $(r \times r)$-minors of M. An important structural feature of the ideal $I_r(M)$ is its *primary decomposition* into an intersection of primary ideals. This decomposition is analogous to the decomposition of a positive integer into a product of prime powers. Just like factorization of integers into primes, the primary decomposition of an ideal is very difficult to compute in general. Recent studies have described the structure of the primary decomposition of $I_2(M)$. However, the case when $r > 2$ is substantially more complicated. We will present an analysis of the primary decomposition of $I_3(M)$ for generalized Hankel matrices up to size 5×5.