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Towards an algebraic proof for the Codimension One Theorem

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In 1996, David Cox proved that for a given projective toric variety of dimension n, its homogeneous coordinate ring modulo $n+1$ forms with the same ample degree, that do not vanish simultaneously, must have dimension one in the component of the critical degree of the forms.

This result, known as the Codimension One Theorem, was generalized by Cattani-Cox-Dickenstein and even further by Cox-Dickenstein. We will discuss these generalizations and their geometric ingredients involved in their proofs. We will conclude with an algebraic proof of Cox's theorem in the case of a product of projective spaces.

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