**On the Stability of a Family of Matrix Polynomials**

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**Abstract.**

This talk investigates the stability of a specific class of matrix polynomials with complex coefficients. Namely, we consider a family of matrix polynomials of the form

$$f_n(z) = A_0 z^n + A_1 z^{n-1} + \cdots + A_n,$$

where each coefficient $A_j$ is a $q \times q$ complex matrix. Using the Hermite-Biehler-type decomposition

$$f_n(z) = h_n(z^2) + z g_n(z^2),$$

together with the theory of Bezoutian forms and orthogonal matrix polynomials on the interval $[0, +\infty)$, we prove that $f_n(z)$ is a stable matrix polynomial. Specifically, we demonstrate that the determinantal polynomial $\det f_n(z)$ has all its roots situated in the open left-half of the complex plane $\mathbb{C}$. These results provide a deeper link between the theory of orthogonal matrix polynomials and the robust stability of multi-variable dynamical systems.