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Toward the classification of Exceptional Orthogonal Polynomials

Exceptional Orthogonal Polynomials are orthogonal polynomial families that arise as solutions for second-order eigenvalue problems. They generalize the classical families of Hermite, Laguerre, and Jacobi in that they allow for polynomial sequences with a finite number of missing degrees. The fundamental technique for constructing such objects is the Darboux transformation, which "dresses" a classical operator to obtain orthogonal polynomials with a finite number of exceptional degrees. Thanks to a foundational theorem that asserts that all exceptional orthogonal polynomials arise in precisely this fashion, it is now possible to envisage a complete classification of exceptional orthogonal operators and their attendant operators. In my talk I will describe the essential components of this programme and highlight the technical challenges that must be overcome en route to classification.