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Using fully matricial functions to compute distributions of polynomials in unitarily invariant random matrices

In this talk we will indicate how fully matricial (or non-commutative) functions can be used to great effectiveness to find the asymptotic distributions of selfadjoint polynomials in unitarily invariant random matrices, as the size of the matrices tends to infinity. We will show that fully matricial functions remain somewhat useful also in studying some aspects of distributions of random matrices before letting the size of the matrix tend to infinity. The talk will be mostly a survey of recent and ongoing joint works with several co-authors.