Seminarios de investigación
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Time-and-band limiting for matrix valued orthogonal polynomials

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In this talk we try to give a survey of the current state of the problem of time-and band-limiting in connection with matrix valued orthogonal polynomials satisfying differential equations (i.e a bispectral situation), taking into consideration the references below.

For a given family of matrix orthogonal polynomials one considers the global operator defined by a full symmetric matrix or an integral operator, given by the truncated inner products. The problem is to search for a local operator given by a narrow band matrix or a differential operator (respectively), with simple spectrum, commuting with this operator. The existence of a commuting local operator is very useful to compute numerically the eigenfunctions of the given global operator.

This question is motivated by the work of Claude Shannon and a series of papers by D. Slepian, H. Landau and H. Pollak at Bell Labs in the 1960's.

References

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Complex orthogonal polynomials, properties and applications

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Complex non-Hermitian polynomials are orthogonal with respect to a complex weight on a curve or set of curves in the complex plane. They appear in Padé approximation, in the analysis of complex quadrature rules, in non-Hermitian random matrix models and when studying certain families of solutions of the Painlevé differential equations. In this talk we will illustrate some of their properties using recent cases studied in the literature.

Appell-Dunkl sequences and applications

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An Appell sequence is a sequence of polynomials with a polynomial of degree n for every n and such that, except by a multiplicative constant, the derivative or the polynomial of degree n is the polynomial of degree $n-1$ of the sequence. In an alternative way, an Appell sequence can be obtained by means of a a suitable generating function. Examples of Appell sequence are x^n, the Bernoulli polynomials, the Euler polynomials and he Hermite polynomials. If the role of the derivative is changed by the Dunkl operator on the real line, in such way that the Dunkl operator applied to the polynomial of degree n is the polynomial of degree $n-1$ of the sequence, we have Appell-Dunkl sequences. Of course, this kind of sequences can be obtianed, again, by some kind of generating function. We will some properties of Appell-Dunkl sequences, examples (for instance, the Bernoulli-Dunkl polynomials), and applications.