Accurate computations with matrices associated to q-Jacobi polynomials

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Abstract: A matrix is totally positive if all its minors are nonnegative [1]. A remarkable property of nonsingular totally positive matrices is that they can be factorized as a product of nonnegative bidiagonal matrices. This representation is known as bidiagonal decomposition and, if it is known accurately, it can be used as a parameterization to solve many common problems in numerical linear algebra with high relative accuracy [2, 3]. This has been possible for some collocation matrices of important bases of polynomials such as Bernstein polynomials or the monomials, as well as families of orthogonal polynomials like Laguerre polynomials, Bessel polynomials or Jacobi polynomials.

In this talk, we will consider the case of the little q-Jacobi polynomials, which extends some of the families of orthogonal polynomials previously mentioned. We will show under which circumstances it is possible to achieve accurate computations with their collocation matrices.

References:

[1] A. Pinkus. Totally positive matrices, Cambridge Tracts in Math., 181 Cambridge University Press, Cambridge, (2010).

[2] P. Koev. Accurate eigenvalues and SVDs of totally nonnegative matrices, SIAM J. Matrix Anal. Appl., 27: 1-23 (2005).

[3] P. Koev. Accurate computations with totally nonnegative matrices, SIAM J. Matrix Anal. Appl., 29: 731-751 (2007).