Distance Fibonacci polynomials in a graph, combinatorial and matrix perspective

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The classical Fibonacci polynomials defined by the recurrence relation

$$f_n(x) = xf_{n-1}(x) + f_{n-2}(x), \quad n \geqslant 2,$$

with initial conditions $f_0(x) = 0, f_1(x) = 1$ were introduced by the Belgian mathematician E.C. Catalan in 1883 and have been intensively studied since then. The interest in these polynomials has contributed to the emergence of many generalizations. In the talk we present a generalization given by the following recursion

$$f_n(k, x) = xf_{n-1}(k, x) + f_{n-k}(k, x), \quad n \geqslant k,$$

with initial conditions $f_n(k, x) = x^n$ for $n = 0, 1, \ldots k-1, \ k \geqslant 2$. We focus on a graph interpretation of these polynomials, their connections with Pascal's triangle and relations with Hessenberg matrices.

References

[1] U. Bednarz, M.Wołowiec-Musiał, Distance Fibonacci Polynomials, *Symmetry* 2020,12(9), 1540, pp.1-14.

[2] U. Bednarz, M.Wołowiec-Musiał, Distance Fibonacci Polynomials - Part II, *Symmetry* 2021, 13(9), 1723, pp.1-10.