Chebyshev polynomials in the complex plane

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In my poster I will present work on Chebyshev polynomials related to compact subsets of the complex plane. In its general form these are polynomials related to a compact set $\mathsf{E} \subset \mathbb{C}$ in the sense that they are the polynomials

$$T_n^{\mathsf{E}}(z) = z^n + \text{lower order terms}$$

which have the smallest value of $\max_{z\in\mathsf{E}} |T_n^{\mathsf{E}}(z)|$ among all monic polynomials of degree n.

The results we have derived were first conjectured based on numerical data that we attained using a complex generalisation of the Remez algorithm due to P. Tang. By using this algorithm to compute Chebyshev polynomials we have been able to get a good guess on the corresponding asymptotics for a wide variety of sets, and for certain classes of sets we have been able to prove these results.

I will specifically focus on Chebyshev polynomials related to sets which are given as polynomial preimages. I will focus on the process of relating the numerical evidence we have gathered to theoretical concepts and display various conjectures and the numerical results which suggests that these should be true.

The numerical implementation of the algorithm was carried out jointly with J. Manriquez at Lund university and the theoretical results were shown in collaboration with J. Christiansen at Lund university and B. Eichinger at TU Wien.

Joint work with Jacob S. Christiansen (Lund University, Sweden), Benjamin Eichinger (TU Wien, Austria) and Jaime Manriquez (Lund University, Sweden).