Kissing polynomials

Arieh Iserles
University of Cambridge, United Kingdom
ai@damtp.cam.ac.uk

Our point of departure are Gauss-like methods for highly oscillatory quadrature of integrals $\int_{-1}^{1} f(x)e^{\mathrm{i}\omega x}\mathrm{d}x$, $\omega \gg 1$, employing orthogonal polynomials with a complex-valued weight function. Such polynomials pose fascinating questions of existence and their zeros, plotted in the complex plane as a function of the underlying frequency ω, exhibit an intriguing pattern of "kissing". All this will be analysed and elucidated in the talk. Our main tool is asymptotic analysis for $\omega \gg 1$ of Hankel determinants, represented by multivariate highly oscillatory integrals, and their generalisations.

Joint work with Andreas Asheim (NTNU Trondheim), Alfredo Deaño (KU Leuven) and Daan Huybrechs (KU Leuven).