

## NITheCS COLLOQUIUM: Rational Fourier Approximation and Nonlinear PDEs

Prof André Weideman (Stellenbosch University)

**DATE:** Monday, 10 June 2024 | 16h00–17h00 SAST

**VENUES:**

- Neelsie Cinema, Stellenbosch University
- Online

### ABSTRACT

The focus of the talk is Fourier approximation, with particular application in the field of nonlinear time-dependent PDEs. In the case of periodic boundary conditions, the Fourier spectral method, combined with an appropriate time-integrator, is a highly accurate method for solving such PDEs. When converted to rational form, its usefulness can be extended to more challenging situations, such as the removal of oscillations near shocks, or analytic continuation into the complex plane for studying singularity dynamics. Several examples involving PDEs such as the Burgers and Korteweg-de Vries equations will be presented.

### BIOGRAPHY

JAC (André) Weideman is Professor of Applied Mathematics at Stellenbosch University. He was born in Bloemfontein and educated at the University of the Orange Free State (UOFS) in the same city. In the period 1980-1999 he occupied academic positions at the UOFS, as well as MIT (visiting) and Oregon State University (OSU) in the USA. At OSU he was promoted to Associate Professor in 1995 before returning to South Africa in 1999 to take up his current position.

Among Prof Weideman's most cited research is an early paper on the numerical solution of the nonlinear Schrödinger equation, and mid-career papers on software for spectral methods for differential equations, as well as an algorithm for the computation of the complex error function. His recent interests include the numerical inversion of the Laplace transform, contour integral methods for PDEs, and the computation of the Painlevé transcendents in the complex plane.

Prof Weideman is associate editor of *Numerical Algorithms* and *Electronic Transactions of Numerical Analysis*, and was elected a SIAM (Society for Industrial and Applied Mathematics) Fellow in 2017.



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