

SEMTE-SECEE Seminar

Computing with Chebfun

Nick Trefethen FRS
Professor of Numerical Analysis
Oxford University

Abstract

Anyone who uses Matlab will want to try Chebfun, a freely-available package that overloads Matlab's familiar operations on vectors to apply to functions of a continuous variable. Thus in Matlab, SUM(f) adds up the entries of a vector, but in Chebfun, it computes the integral of a function. MAX(f) finds the maximum, ROOTS(f) finds the roots, and so on. Under the hood, everything is based on piecewise expansions in Chebyshev polynomials, but in principle you don't need to know that. This will be a hands-on demonstration talk, and attendees are welcome to bring a laptop running Matlab if they want try Chebfun on the spot. Just as Chebfun turns vectors into functions, it turns matrices into operators, notably differential and integral operators. One of our proudest achievements is that we've overloaded Matlab's backslash command to solve linear and nonlinear differential equations, typically to close to machine precision in a fraction of a second. Many examples will be shown.

Biosketch

Nick Trefethen is Professor of Numerical Analysis and Head of the Numerical Analysis Group at Oxford University. He is the President of the Society for Industrial and Applied Mathematics. Nick is an Institute for Scientific Information Highly Cited Researcher whose contributions to scientific computing and numerical analysis also include four influential books. He is the "father" of pseudospectral theory. Among his many honors, he is the winner of the inaugural Leslie Fox Prize for Numerical Analysis, a Fellow of the British Royal Society, and a member of the US National Academy of Engineering. He has also been awarded the IMA Gold Medal in 2010 in recognition of his outstanding contributions to mathematics and its applications over a period of years. He has been invited to lecture both at the International Congress of Mathematicians and at the International Congress on Industrial and Applied Mathematics.

March 2, 2011, 3:00 – 4:00 PM,
Global Institute of Sustainability (GIOS) 201

