

# ROBUST RATIONAL INTERPOLATION AND PADE APPROXIMATION

Lloyd N. Trefethen, University of Oxford

Approximating functions or data by polynomials is an everyday tool, starting with Taylor series. Approximating by rational functions can be much more powerful, but also much more troublesome. In different contexts rational approximations may fail to exist, fail to be unique, or depend discontinuously on the data. Some approximations show forests of seemingly meaningless pole-zero pairs or "Froissart doublets", and when these artifacts should not be there in theory, they often appear in practice because of rounding errors on the computer. Yet for some applications, like extrapolation of sequences and series, rational approximations are indispensable.

In joint work with Pedro Gonnet and Ricardo Pachon we have developed an elementary method to get around most of these problems in rational interpolation and least-squares fitting, based on the singular value decomposition. The talk will include many examples.