Accuracy and Stability of Scalar Polynomial Root Finders and Matrix Polynomial Eigensolvers

Françoise Tisseur*[1]

[1]University of Manchester [Manchester] – Royaume-Uni

Résumé

Backward errors and condition numbers play an important role in modern numerical linear algebra. They are complementary
concepts: when combined with a backward error estimate, a condition number provides an approximate upper bound on the error
in a computed solution. Backward errors and condition numbers depend on how perturbations are measured, e.g., in an absolute
or relative normwise or componentwise sense, and these can lead to very different results.

For example, Aurentz, Vanderbril and Watkins (SIMAX 2015) produced a fast and backward stable algorithm for the computation
of roots of scalar polynomials, whereas Mastronardi and Van Dooren (ETNA 2015) showed that there is no numerical method that
can compute roots of scalar polynomials in an elementwise backward stable sense even in the quadratic case.

In this talk, we discuss the different ways of measuring perturbations, their interpretations, and what can be learnt from them to
design or improve algorithms for polynomial root finders and matrix polynomial eigensolvers.

*Intervenant