Solving Irregular Triangular Systems: a Truly Local Approach

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Root isolation, and more generally root clustering, of a univariate polynomial is a fundamental computational problem. In the last 5 years, we have seen the development of novel asymptotically “near-optimal” algorithms that are both implementable and practical.

To extend these advances to the multivariable setting, we consider the problem of clustering the zeros of a 0-dimensional triangular polynomial system,

\[ f_1(x_1) = \cdots = f_n(x_1, \ldots, x_n) = 0. \]

All current algorithms require the system to satisfy some conditions of “regularity”. In this talk, we introduce a new technique that avoids any such condition. Our algorithm operates in a very general setting where the coefficients of \( f_i \)’s are oracle complex numbers.