

The Probability of Multiple Roots

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The problem of finding the roots of a given univariate polynomial is one of the oldest in the history of mathematics. From a numerical point of view, it is ill-posed: a slight change in the coefficient may lead to a qualitative change of the multiplicity pattern. However, it has been observed that the problem is numerically stable when we restrict to a fixed multiplicity pattern (see [2]).

We may consider the root computation as an “inverse problem”: the complex roots plus multiplicity information uniquely determine the known coefficients, by the formula of Viète. Using the Bayesian framework, we can then compute posterior probabilities of the various multiplicity patterns.

- [1] H. K. PIKKARAINEN, J. SCHICHO: Bayesian root finding. *Math. Comp. Sci.*, to appear.
- [2] Z. ZENG: Computing multiple roots of inexact polynomials. *Math. Comp.* **74** (2005), 869–903.