



THE UNIVERSITY OF
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Local-to-Global Methods for Solving Likelihood Equations

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ABSTRACT

Homotopy continuation is a fundamental method in nonlinear algebra. The idea is to use numerical predictor-corrector methods to track solutions of the start system to solutions of a target system. When the start system is taken to itself, the homotopy is said to be a monodromy. The start solutions of a monodromy need not be tracked to themselves. In fact, from one solution, we are able to compute every solution to the system of equations with repeated monodromies (under reasonable hypothesis). This leads to the following problem: Give a stopping criteria for the repeated monodromy process to find all solutions to the system of equations.

In 2002, an answer to this question was given for systems of equations with one variable group in the form of a trace test. In my research, I am motivated by problems in statistics such as maximum likelihood estimation and the method of moments. These problems have a two variable group structure and the classic trace test cannot be applied effectively. In my recent work, I give a stopping criteria in the form of a trace test for systems with a multivariable group structure (joint with Hauenstein). Furthermore, we give a presentation and extension of these results for systems with two variable group structure (joint with Leykin and Sottile). Illustrative examples and motivations by the likelihood equations will be provided throughout the talk. If time permits, then future work on symmetries of the system, compressed witness sets, and computation over the reals will be discussed.

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