



# THE UNIVERSITY OF CHICAGO

Departments of Computer Science, Mathematics, Statistics and the Computation Institute  
**SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR**

---

**JOSE RODRIGUEZ**

Department of Statistics  
University of Chicago

## Homotopies for Solving Systems of Equations

THURSDAY, February 2, 2017 at 4:30 PM  
226 Jones Laboratory, 5747 S. Ellis Avenue

### ABSTRACT

Homotopy continuation is a fundamental method in nonlinear algebra. The idea is to begin with a start system that is easy to solve. Then, one uses numerical predictor-corrector methods to track solutions of the start system to solutions of a target system. In this talk, the focus will be on target systems defined by polynomials. These systems have a generic root count which is called the degree.

The first part of the talk will introduce homotopies that utilize the degree. Examples from maximum likelihood estimation and Pearson's method of moments will be provided. The second part of the talk will introduce a local-to-global method for solving polynomial systems of equations. This method involves monodromy homotopies and the trace test. If time permits, examples from chemical reaction networks, current work on the generalized method of moments (joint with Lek-Heng Lim), and results in algebraic kinematics will be presented.

---

#### **Organizers:**

Lek-Heng Lim, Department of Statistics, [lekheng@galton.uchicago.edu](mailto:lekheng@galton.uchicago.edu)

Ridgway Scott, Departments of Computer Science and Mathematics, [ridg@cs.uchicago.edu](mailto:ridg@cs.uchicago.edu)

Jonathan Weare, Department of Statistics and The James Franck Institute, [weare@uchicago.edu](mailto:weare@uchicago.edu).

SSC Seminar URL: [http://www.stat.uchicago.edu/seminars/SSC\\\_seminars.shtml](http://www.stat.uchicago.edu/seminars/SSC\_seminars.shtml).

If you wish to subscribe to our email list, please visit the following website:  
<https://lists.uchicago.edu/web/arc/statseminars>.