The University of Chicago
Departments of Computer Science,
Mathematics, and Statistics

## Scientific and Statistical Computing Seminar

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# High Performance Quadrature Rules: How Numerical Integration Affects a Popular Model of Product Differentiation

**FRIDAY, March 30, 2012 at 3:30 PM**
133 Eckhart Hall, 5734 S. University Avenue.

## ABSTRACT


Efficient, accurate, multi-dimensional, numerical integration has be- come an important tool for approximating the integrals which arise in modern economic models built on unobserved heterogeneity, incomplete information, and uncertainty. This paper demonstrates that polynomial- based rules out-perform number-theoretic quadrature (Monte Carlo) rules both in terms of efficiency and accuracy. To show the impact a quadra- ture method can have on results, we examine the performance of these rules in the context of Berry, Levinsohn, and Pakes (1995)s model of product differentiation, where Monte Carlo methods introduce consider- able numerical error and instability into the computations. These prob- lems include inaccurate point estimates, excessively tight standard errors, instability of the inner loop contraction mapping for inverting market shares, and poor convergence of several state of the art solvers when com- puting point estimates. Both monomial rules and sparse grid methods lack these problems and provide a more accurate, cheaper method for quadrature. Finally, we demonstrate how researchers can easily utilize high quality, high dimensional quadrature rules in their own work.

This is joint work with Ken Judd.


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