



THE UNIVERSITY OF CHICAGO

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

Robert Kirby
Mathematics Department
Baylor University

Fast Simplicial Finite Elements via Bernstein Polynomials

THURSDAY, October 27, 2016 at 4:00 PM
226 Jones Laboratory, 5747 S. Ellis Avenue
Host: Ridgway Scott

ABSTRACT

For many years, sum-factored algorithms for finite elements in rectangular reference geometry have combined low complexity with the mathematical power of high-order approximation. However, such algorithms rely heavily on the tensor product structure inherent in the geometry and basis functions, and similar algorithms for simplicial geometry have proven elusive.

Bernstein polynomials are totally nonnegative, rotationally symmetric, and geometrically decomposed bases with many other remarkable properties that lead to optimal-complexity algorithms for element wise finite element computations. They also form natural building blocks for the finite element exterior calculus bases for the de Rham complex so that $H(\text{div})$ and $H(\text{curl})$ bases have efficient representations as well. We will also discuss their relevance for explicit discontinuous Galerkin methods, where the element mass matrix requires special attention.

Organizers:

Lek-Heng Lim, Department of Statistics, lekheng@galton.uchicago.edu
Ridgway Scott, Departments of Computer Science and Mathematics, ridg@cs.uchicago.edu
Jonathan Weare, Department of Statistics and The James Franck Institute, weare@uchicago.edu.
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