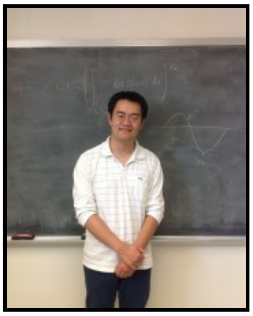

Computational Mathematics Seminar Series

Discrete ABP Estimate and Rates of Convergence of Linear Elliptic PDEs in Non-divergence Form

Wujun Zhang, University of Maryland

Digital Media Center 1034
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Abstract:
We design a finite element method (FEM) for linear elliptic equations in non-divergence form, which hinges on an integro-differential approximation of the PDE. We show the FEM satisfies the discrete maximum principle (DMP) provided that the mesh is weakly acute. Thanks to the DMP and consistency property of the FEM, we establish convergence of the numerical solution to the viscosity solution.

We derive a discrete Alexandroff-Bakelman-Pucci (ABP) estimate for finite element methods. Its proof relies on a geometric interpretation of Alexandroff estimate and control of the measure of the sub-differential of piecewise linear functions in terms of jumps, and thus of the discrete PDE. The discrete ABP estimate leads to optimal rates of convergence for the finite element method under suitable regularity assumptions on the solution and coefficient matrix.

Speaker's Bio:
Wujun Zhang obtain his Ph.D. in Mathematics from University of Minnesota, twin cities in 2012. His thesis addresses the a posteriori error estimation and adaptivity for hybridizable discontinuous Galerkin (HDG) methods. Currently, he is a Brin Post-doctoral fellow at Department of Mathematics, the University of Maryland, College Park.

He is interested in the general area of applied mathematics with a particular emphasis on computational mathematics and numerical analysis. His current research interest focus on the numerical approximation of: fully nonlinear elliptic PDEs, liquid crystals with variable degree of orientation, and anisotropic a posteriori error estimate and adaptivity.

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