Mathematics, Statistics, and Computer Science **@ UIC**

Applied Mathematics Seminar

Discrete ABP estimate and rates of convergence of linear elliptic PDEs in non-divergence form

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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.

Monday, November 24 at 4:00 PM in SEO 636