HONGJIE DONG

Division of Applied Mathematics
Brown University
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Employment

Brown University: 2007.7–
Assistant Professor (tenure track).
Member of the Lefschetz Center for Dynamical Systems.

University of Pennsylvania: 2010.9–2010.12
Visiting Professor (Sabbatical).

Institute for Advanced Study: 2006.9–2007.6, 2008.9–2008.12
Member, Visiting Scholar.

Mathematical Sciences Research Institute: 2007.7–2007.8
Member of "Summer Microprogram on Nonlinear Partial Differential Equations".

University of Chicago: 2005.9–2006.8
L.E. Dickson Instructor and research post-doctor.

University of Minnesota: 2001.9–2005.8.
Research Assistant of Prof. Nicolai V. Krylov.
Teaching Assistant.

Education

University of Minnesota: 2001.9–2005.8
Ph.D. in Mathematics.
Thesis advisor: Professor Nicolai V. Krylov.

Fudan University: 1997.9–2001.7
B.S. in Mathematics.
Thesis advisor: Professor Jiaxing Hong.

Research Interests

Partial Differential Equations: nonlinear elliptic and parabolic PDEs, Navier-Stokes equations and related equations, reaction diffusion equations, unique continuation problems, solvability of PDEs with rough coefficients.

Probability: probabilistic approach of PDEs, stochastic processes, stochastic control theory.

Numerical Analysis: rates of convergence of finite difference approximations.

Date: February 4, 2011.

PUBLICATIONS

1. About smoothness of solutions of the heat equations in closed smooth space-time domains, *Comm. Pure Appl. Math.* **58** (2005) no. 6, 799–820.
2. On the rate of convergence of finite-difference approximations for Bellman's equations with constant coefficients, with N.V. Krylov, *Algebra i Analis (St. Petersburg Math. J.)* **17** (2005), no. 2, 108–132.
3. On the local smoothness of solutions of the Navier-Stokes equations, with D. Du, *J. Math. Fluid Mech.* **9** (2007), no. 2, 139–152.
4. Rate of convergence of finite-difference approximations for degenerate linear parabolic equations with C^1 and C^2 coefficients, with N.V. Krylov, *Electro. J. Differential Equations* **2005** (2005), no. 102, 1–25.
5. Hessian equations with elementary symmetric functions, *Comm. Partial Differential Equations.* **31** (2006) no. 7, 1005–1025.
6. On time inhomogeneous controlled diffusion processes in domains, with N.V. Krylov, *Annal. Prob.* **35** (2007), no. 1, 206–227.
7. On the rate of convergence of finite-difference approximations for Bellman equations with Lipschitz coefficients in domains, with N.V. Krylov, *Appl. Math. Optim.* **56** (2007), no. 1, 37–66.
8. Unique continuation for the schrödinger equation with gradient vector potentials, with W. Staubach, *Proc. Amer. Math. Soc.* **135** (2007), no. 7, 2141–2149.
9. On uniqueness of boundary blow-up solutions of a class of nonlinear elliptic equations, with S. Kim and M.V. Safonov, *Comm. Partial Differential Equations* **33** (2008), no. 2, 177–188.
10. Partial regularity of weak solutions of the Navier-Stokes equations in $\mathbb{R}^4$ at the first blow-up time, with D. Du, *Comm. Math. Phys.* **273** (2007), no. 3, 785–801.
11. Spatial analyticity of the solutions to the sub-critical dissipative Quasi-geostrophic equations, with D. Li, *Arch. Rational Mech. Anal.* **189** (2008), no. 1, 131–158.
12. Global well-posedness and a decay estimate for the critical dissipative quasi-geostrophic equation, with D. Du, *Discrete Contin. Dyn. Syst.* **21** (2008), no. 4, 1095–1101.
13. Finite time singularities for a class of generalized surface quasi-geostrophic equations, with D. Li, *Proc. Amer. Math. Soc.* **136** (2008), no. 7, 2555–2563.
14. On the Green's matrices of strongly parabolic systems of second order, with S. Cho and S. Kim, *Indiana Univ. Math. J.* **57** (2008), no. 4, 1633–1678.
15. Optimal local smoothing and analyticity rate estimates for the generalized Navier-Stokes equations, with D. Li, *Comm. Math. Sci.* **7** (2009), no. 1, 67–80.
16. Green's matrices of second order elliptic systems with measurable coefficients in two dimensional domains, with S. Kim, *Trans. Amer. Math. Soc.* **361** (2009), no. 6, 3303–3323.
17. Well-posedness for a transport equation with nonlocal velocity, *J. Funct. Anal.* **255** (2008), no. 11, 3070–3097.

18. A regularity criterion for the dissipative quasi-geostrophic equations, with N. Pavlović, *Ann. Inst. H. Poincare Anal. Non Lineaire* **26** (2009), no. 5, 1607–1619.
19. Finite time singularities and global well-posedness for fractal Burgers' equation, with D. Du and D. Li, *Indiana Univ. Math. J.* **58** (2009), no. 2, 807–821.
20. Dissipative quasi-geostrophic equations in critical Sobolev spaces: smoothing effect and global well-posedness, *Discrete Contin. Dyn. Syst.* **26** (2010) no. 3, 1197–1211.
21. Regularity criteria for the dissipative quasi-geostrophic equations in Hölder spaces, with N. Pavlović, *Comm. Math. Phys.* **290** (2009), no. 3, 801–812.
22. Elliptic equations in divergence form with partially BMO coefficients, with D. Kim, *Arch. Rational Mech. Anal.* **196** (2010), no. 1, 25–70.
23. The Navier-Stokes equations in the critical Lebesgue space, with D. Du, *Comm. Math. Phys.* **292** (2009), no. 3, 811–827.
24. Second-order elliptic and parabolic equations with $B(\mathbb{R}^2, VMO)$ coefficients, with N. V. Krylov, *Trans. Amer. Math. Soc.* **362** (2010), no. 12, 6477–6494.
25. Parabolic and elliptic systems with VMO coefficients, with D. Kim, *Methods Appl. Anal.* **16** (2009), no. 3, 365–388.
26. Solvability of parabolic equations in divergence form with partially VMO coefficients, *J. Funct. Anal.* **258** (2010), no. 7, 2145–2172.
27. Parabolic equations with variably partially VMO coefficients, *Algebra i Analis (St. Petersburg Math. J.)*, to appear (2010).
28. Partial Schauder estimate for second-order elliptic and parabolic equations, with S. Kim, *Calc. Var. Partial Differential Equations*, **40** (2011) no. 3–4, 481–500.
29. On the 2D critical and supercritical dissipative quasi-geostrophic equation in Besov spaces, with D. Li, *J. Differential Equations* **248** (2010), no. 11, 2684–2702.
30. L_p solvability of divergence type parabolic and elliptic systems with partially BMO coefficients, with D. Kim, *Calc. Var. Partial Differential Equations* **40** (2011) no. 3–4, 357–389.
31. On the L_p-solvability of higher order parabolic and elliptic systems with BMO coefficients, with D. Kim, *Arch. Rational Mech. Anal.*, DOI: 10.1007/s00205-010-0345-3, (2010).
32. Solvability of second-order equations with hierarchically partially BMO coefficients, *Trans. Amer. Math. Soc.*, to appear (2010).
33. The aggregation equation with power-law kernels: ill-posedness, mass concentration and similarity solutions, *Comm. Math. Phys.*, to appear (2010).
34. Parabolic and elliptic systems in divergence form with variably partially BMO coefficients, with D. Kim, *SIAM J. Math. Anal.*, to appear (2011).

Preprints and Work in progress

1. Global estimates for Green's matrix of second order parabolic systems with application to elliptic systems in two dimensional domains, with S. Cho and S. Kim, submitted (2010).
2. Global regularity of weak solutions to quasilinear elliptic and parabolic equations with controlled growth, with D. Kim, submitted (2010).

3. On fully nonlinear elliptic and parabolic equations in domains with VMO coefficients, with N. V. Krylov and X. Li, submitted (2010).
4. Green's functions for parabolic systems of second order in time-varying domains, with S. Kim, submitted (2010).
5. Gradient estimates for parabolic and elliptic systems from linear laminates, submitted (2011).
6. Higher order elliptic systems in Sobolev spaces with partially BMO coefficients, with D. Kim, submitted (2010).
7. On similarity solutions to the multidimensional aggregation equation, submitted (2011).
8. Partial regularity of steady-state solutions to the 6D Navier-Stokes equations, with R. Strain, submitted (2011).
9. On L_p-estimates for nonlocal elliptic equations, with D. Kim, submitted (2011).

Honors and Awards

NSF CAREER Award: DMS-1056737 (P.I.), 2011.7–2016.6.

NSF Grant: DMS-0800129 (P.I.), 2008.7–2011.6.

MSRI Membership: 2007.7–2007.8.

IAS Membership: 2006–2007, 2008.9–2008.12.

Travel Grant from AMS for ICM 2006, Madrid, Spain: August 22–30, 2006.

Outstanding Graduate: Fudan University, 2001.

The First, Second Prizes of People's Scholarship: Fudan University, 1998–2001.

Meritorious Winner of Mathematical Contest in Modeling: The Consortium for Mathematics and its Applications, 2000.

Perfect Paper on the American Invitational Mathematics Examination: The Mathematical Association of America, 1997.

The First Prize of Chinese Mathematical Olympiad: rank top 4 in P.R.China, 1997.

The First, Second Prizes: in contests of Mathematics, Physics and Chemistry, 1991–1997.

Conference and Workshop Talks

- AMS sectional meeting, Georgia Southern University, Statesboro, GA, March 12–13, 2011.
- AMS sectional meeting, UCLA, Los Angeles, CA, October 9–10, 2010.
- AMS sectional meeting, Florida Atlantic University, Boca Raton, FL, October 30–November 1, 2009.
- AMS sectional meeting, Baylor University, Waco, TX, October 16–18, 2009
- The Twelfth Rivière-Fabes Symposium on Analysis and PDE, School of Mathematics, University of Minnesota, April 17-19, 2009. *Regularity of elliptic and parabolic equations with rough coefficients.*
- AMS/MAA Joint meeting, Washington, DC, January 8, 2008. *Rigidity of Landau's solutions to the Navier-Stokes equations.*

- 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, UT Arlington, Arlington, TX, May 18, 2008 to May 21, 2008. *Finite time singularities and global well-posedness for fractal Burgers equation.*
- MSRI Summer Microprogram on Nonlinear Partial Differential Equations, MSRI, Berkeley, CA, July 23, 2007 to August 10, 2007. *On the Green's matrices of strongly elliptic and parabolic systems of second order.*
- Asymtotic Analysis in Stochastic Processes, Nonparametric Estimation and Related Problems, Wayne State University, Detroit, MI, September 16, 2006. *On time inhomogeneous controlled diffusion processes in domains.*
- Probabilistic and Analytical Perspectives on Contemporary PDEs, Carnegie Mellon University, Pittsburgh PA, May 29, 2006. *About smoothness of solutions of the heat equations in closed smooth space-time domains.*
- Frontiers of Applied Analysis, Carnegie Mellon University, Pittsburgh PA, Sept. 9, 2005. *Rate of convergence of finite-difference approximations for Bellman's equations with constant coefficients.*
- International Summer School on Fully Nonlinear Partial Differential Equations and Applications, Zhejiang University, June 7, 2005. *Hessian equations with elementary symmetric functions.*
- Statistics, Numerical Analysis, II, AMS/MAA Joint meeting, Atlanta, Georgia, January 6, 2005. *Rate of convergence of finite-difference approximations for Bellman's equations with constant coefficients.*

Seminar Talks

- *Analysis seminar,* University of Pennsylvania, October 26, 2010.
- *PDE seminar,* University of Minnesota, March 4, 2010.
- *PDE seminar,* Ohio State University, January 20, 2010.
- *PDE seminar,* University of Connecticut, November 2, 2009.
- *Geometry and Analysis seminar,* Columbia University, October 8, 2009.
- *School of Mathematical Sciences,* Fudan University, June 10, 2009.
- *Boston University/Brown University PDE Seminar,* May 1, 2009.
- *Guest lecture in Geometric PDE,* IAS, November 26, 2008.
- *Nonlinear Analysis and PDEs Seminar,* Rutgers University, November 19, 2008.
- *Talks by Members,* Institute for Advanced Study, September 24, 2008.
- *Analysis/PDE Seminar,* MIT, September 10, 2008.
- *Analysis Seminar,* University of Texas at Austin, March 26, 2008.
- *PDE Seminar,* Brown University, October 12, 2007.
- *Ergodic Theory and Statistical Mechanics Seminar,* Princeton University, March 8, 2007.
- *Mathematical physics seminar,* IAS, February 21, 2007.
- *Nonlinear Analysis and PDEs Seminar,* Rutgers University, February 13, 2007.

- *School of Mathematical Sciences,* Fudan University, January 8, 2007.
- *PDE/Applied Math Seminar,* University of Maryland, December 14, 2006.
- *Special Talk – Stochastic Systems Seminar,* Brown University, December 5, 2006.
- *PDE Seminar,* Brown University, December 1, 2006.
- *Analysis Seminar,* Princeton University, November 27, 2006.
- *PDE Seminar,* University of Minnesota, November 8, 2006.
- *Talks by Postdoctoral Members,* Institute for Advanced Study, October 11, 2006.
- *PDE Seminar,* Northwestern University, Evanston IL, May 11, 2006.
- *Calderón-Zygmund Analysis Seminar,* University of Chicago, Chicago IL, May 1, 2006.
- *Calderón-Zygmund Analysis Seminar,* University of Chicago, Chicago IL, Oct. 24, 2005.
- *Applied Mathematics and Numerical Analysis Seminar,* University of Minnesota, February 24, 2005.
- *PDE Seminar,* University of Minnesota, November 6, 2004.

Other Professional Activities

Journal Refereed: Duke Math. J., J. Funct. Anal., Trans. AMS, Math. Comp., Appl. Math. Optim., Numer. Math., SIAM J. Control Optim., SIAM J. Math. Anal., Int. Math. Res. Not., Arch. Rational Mech. Anal., Dyn. Partial Differ. Equ., Methods Appl. Anal., Comm. Partial Differential Equations, Selecta Math., Nonlinearity, Canad. J. Math.

Organizer of PDE Seminar: 2008/09 & 2009/10.

Member of Preliminary Exam Committee for: Zhen Chen, Yang Yang (2010).

Member of Undergraduate Program Advisors: 2009/10.

Member of Professional Organizations: American Mathematical Society (AMS), Society for Industrial and Applied Mathematics (SIAM).

Reviewer of Mathematical Reviews: since 2007.