

Personal Home Page of Xiangjin Xu

RESEARCH INTERESTS

I. Harmonic Analysis on Manifolds:

- Detailed study of the relationship between the growth estimates (L^p , bilinear, multilinear, and gradient estimates) of the eigenfunctions and the global geometric properties on compact manifolds. Apply the eigenfunction estimates to study the location, distribution and size of nodal sets of eigenfunctions, and to study H^1 -ormander multiplier problems, Bochner-Riesz means for eigenfunction expansion on compact manifolds.
- Apply the eigenfunction estimates for spectral projectors on manifolds (with or without boundary) to study well-posedness problems for partial differential equations on compact manifolds, including linear or nonlinear wave equations, Schrödinger equations, 2D (dissipative) quasi-geostrophic equations, and 2D Euler equations.

II. Nonlinear differential equations:

- Study Li-Yau type sharp differential Harnack inequalities, the heat kernel estimates, and the monotonicity of entropy for linear heat equations and Schrödinger operators on Riemannian manifolds with negative Ricci curvature. Study Liouville's Theorems for Schrödinger operators on Riemannian manifolds with nonnegative Ricci curvature.
- Study gradient estimates for degenerate parabolic equations and Liouville's Theorems, local Aronson-Benilan estimates and entropy formulae for Porous Media Equations and Fast Diffusion Equations.
- Study the global uniqueness problems and the boundary stabilization, controllability and observability problems for (linear and nonlinear) parabolic and hyperbolic PDE's on manifolds via Carleman estimates.
- Study the Periodic solutions, subharmonics and homoclinic orbits of Hamiltonian systems.

THESIS

1. **Master Thesis:** Periodic solutions of Hamiltonian systems and differential systems. Nankai Institute of Mathematics, Tianjin, China, June 1999.
2. **PhD Thesis:** Eigenfunction Estimates on Compact Manifolds with Boundary and H^1 -ormander Multiplier Theorem. Johns Hopkins University, Baltimore, Maryland, May 2004.(PDF)

PUBLICATIONS

1. **Xiangjin Xu**, Subharmonic solutions of a class of non-autonomous Hamiltonian systems. *Acta Sci. Nat. Univer. Nankai*. Vol. 32, No.2, (1999), pp. 46-50.(In Chinese)
2. Yiming Long, **Xiangjin Xu**, Periodic solutions for a class of nonautonomous Hamiltonian systems. *Nonlinear Anal. Ser. A: Theory Methods*, 41 (2000), no. 3-4, 455-463. (PDF)
3. **Xiangjin Xu**, Homoclinic orbits for first order Hamiltonian systems possessing super-quadratic potentials. *Nonlinear Anal. Ser. A: Theory Methods*, 51 (2002), no. 2, 197-214. (PDF)
4. **Xiangjin Xu**, Periodic solutions for non-autonomous Hamiltonian systems possessing super-quadratic potentials. *Nonlinear Anal. Ser. A: Theory Methods*, 51 (2002), no. 6, 941-955. (PDF)
5. **Xiangjin Xu**, Subharmonics for first order convex nonautonomous Hamiltonian systems. *J. Dynam. Differential Equations* 15 (2003), no. 1, 107-123. (PDF)
6. **Xiangjin Xu**, Multiple solutions of super-quadratic second order dynamical systems. *Dynamical systems and differential equations* (Wilmington, NC, 2002). *Discrete Contin. Dyn. Syst. Ser. B* 3 (2003), suppl., 926-934. (PDF)
7. **Xiangjin Xu**, Sub-harmonics of first order Hamiltonian systems and their asymptotic behaviors. *Nonlinear differential equations, mechanics and bifurcation* (Durham, NC, 2002). *Discrete Contin. Dyn. Syst. Ser. B* 3 (2003), no. 4, 643-654. (PDF)
8. **Xiangjin Xu**, Homoclinic orbits for first order Hamiltonian systems with convex potentials. *Advanced Nonlinear Studies* 6 (2006), 399-410. (PDF)
9. **Xiangjin Xu**, New Proof of H^1 -ormander Multiplier Theorem on Compact manifolds without boundary. *Proc. Amer. Math. Soc.* 135 (2007), 1585-1595.(PDF)
10. Roberto Triggiani, **Xiangjin Xu**, Pointwise Carleman Estimates, Global Uniqueness, Observability, and Stabilization for Schrödinger Equations on Riemannian Manifolds at the H^1 -Level. *AMS Contemporary Mathematics*, Volume 426, 2007, 339-404. (PDF)
11. **Xiangjin Xu**, Gradient estimates for eigenfunctions of compact manifolds with boundary and the H^1 -ormander multiplier theorem. *Forum Mathematicum* 21:3 (May 2009), pp. 455-476. (PDF)
12. **Xiangjin Xu**, Eigenfunction estimates for Neumann Laplacian on compact manifolds with boundary and multiplier problems. *Proc. Amer. Math. Soc.* 139 (2011), 3583-3599.(PDF)
13. Junfang Li, **Xiangjin Xu**, Differential Harnack inequalities on Riemannian manifolds I : linear heat equation.Advance in Mathematics, Volume 226, Issue 5, (March, 2011) Pages 4456-4491 doi:10.1016/j.aim.2010.12.009 (arXiv:0901.3849)
14. Liangui Wang, **Xiangjin Xu**, Hybrid state feedback, robust H_∞ control for a class switched systems with nonlinear uncertainty. Z. Qian et al.(Eds.):Recent Advances in CSIE 2011, Lecture Notes in Electrical Engineering, Volume 129, 2012, pp 197-202
15. **Xiangjin Xu**, Gradient estimates for Δu on manifolds and some Liouville-type theorems. *Journal of Differential Equation* (2011) doi:10.1016/j.jde.2011.08.004 arXiv:0805.3676
16. **Xiangjin Xu**, Upper and lower bounds for normal derivatives of spectral clusters of Dirichlet Laplacian. *Journal of Mathematical Analysis and Applications*, Volume 387, Issue 1, (March, 2012), Pages 374-383 doi:10.1016/j.jmaa.2011.09.003 , ArXiv:1004.2517
17. **Xiangjin Xu**, Characterization of Carleson measures via spectral estimates on compact manifolds with boundary. To appear in SGMC2021 (Edited by D. Wanduku, S. Zheng), Springer Proceedings in Mathematics, Springer Nature, Switzerland()

PREPRINTS AND WORK IN PROGRESS

1. **Xiangjin Xu**, New heat kernel estimates on Riemannian manifolds with negative curvature. ()
2. **Xiangjin Xu**, Differential Harnack inequalities on Riemannian manifolds II: Schrödinger operator. ()
3. Huichao Chen, **Xiangjin Xu**, Power analysis of a left-truncated normal mixture distribution with applications in red blood cell velocities. Presentation (by **H. Chen**) at Joint Statistical Meetings (JSM), Montreal, August, 2013.()
4. **Xiangjin Xu**, Multiple periodic solutions of super-quadratic Hamiltonian systems with bounded forcing terms. ()
5. **Xiangjin Xu**, Periodic and subharmonic solutions of Hamiltonian systems possessing "super-quadratic" potentials. ()

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