

Xifeng Su

Associate Professor
School of Mathematical Sciences
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PERSONAL INFORMATION

Date of Birth: August 2, 1981
Place of Birth: Changshu, Jiangsu Province, China
Address: No. 19 XinJieKouWai St., HaiDian District, Beijing 100875, P. R. China
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FIELDS OF INTEREST

Hamiltonian Dynamics (including KAM theory, converse KAM theory, Aubry-Mather theory, Nekhoroshev estimate, Arnold diffusion); Ergodic Optimization; Variational method and nonlinear analysis; Center manifold theory; Quasi-crystals and tiling dynamics; nonlinear nonlocal elliptic PDEs and Hamilton-Jacobi equations (including singularity propagation)

FUNDINGS

1. National Natural Science Foundation of China (Grant No. 11971060) (2020.01-2023.12)
2. National Natural Science Foundation of China (for youth) (Grant No. 11301513) (2014.01-2016.12)
3. China-France Programme XU Guangqi, with Philippe Thieullen, (2019.02-2019.12)

PUBLICATION

1. Xifeng Su and Rafael de la Llave. *KAM theory for quasi-periodic equilibria in one-dimensional quasi-periodic media*, SIAM Journal on Mathematical Analysis, 2012, Vol. 44, Issue 6, 3901-3927
2. Xifeng Su and Rafael de la Llave. *Percival lagrangian approach to Aubry-Mather theory*, Expositiones Mathematicae, 2012, Vol. 30, Issue 2, pp.182-208
3. Xifeng Su and Lin Wang. *Total destruction of invariant tori for the generalized Frenkel-Kontorova model*, Journal of Mathematical Physics, 2012, Vol. 53, Issue 2, 022702
4. Xifeng Su and Rafael de la Llave. *KAM theory for quasi-periodic equilibria in 1D quasi-periodic media: II. Long-range interactions*, J. Phys. A: Math. Theory, 2012, Vol. 45, No. 45, 455203
5. Yuanhong Wei and Xifeng Su. *Multiplicity of solutions for non-local elliptic*

equations driven by fractional Laplacian, Calculus of Variations and Partial Differential Equations, 2015, Vol. 52, Issue 1-2, pp 95-124. (Corresponding author: Xifeng Su)

6. Rafael de la Llave and Xifeng Su and Lei Zhang. *Resonant Equilibrium Configurations in Quasi-periodic Media: Perturbative Expansions*, Journal of Statistical Physics, 2016, Vol. 162, Issue 6, pp 1522-1538. (Corresponding author: Xifeng Su)
7. Xifeng Su and Lin Wang and Jun Yan. *Weak KAM theory for HAMILTON-JACOBI equations depending on unknown functions*, Discrete and Continuous Dynamical Systems - Series A, 2016, Vol 36, no. 11, 6487–6522.
8. Rafael de la Llave and Xifeng Su and Lei Zhang. *Resonant Equilibrium Configurations in Quasi-Periodic Media: KAM Theory*, SIAM J. Math. Anal., 2017, Vol 49, no. 1, 597–625. (Corresponding author: Xifeng Su)
9. Xifeng Su and Rafael de la Llave. *A continuous family of equilibria in ferromagnetic media are ground states*. Comm. Math. Phys., 2017, Vol 354, no. 2, 459-475.
10. Xifeng Su and Philippe Thieullen. *Convergence of discrete Aubry-Mather model in the continuous limit*. Nonlinearity, 2018, Vol 31, no. 5.
11. Yuanhong Wei and Xifeng Su. *On a class of non-local elliptic equations with asymptotically linear term*. Discrete and Continuous Dynamical Systems - Series A, 2018, Vol 38, no. 12, 6287-6304. (Corresponding author: Xifeng Su)
12. Xifeng Su and Rafael de la Llave. *On a remarkable example of F. Almgren and H. Federer in the global theory of minimizing geodesics*. Discrete and Continuous Dynamical Systems - Series A, 2019, Vol 39, no. 12, 7057-7080.
13. Xifeng Su and Philippe Thieullen. *Gottschalk-Hedlund theorem revisited*, Mathematical Research Letter, 2021, Vol 28, no.1, 285-300.

WORKING PAPER

1. “On the C^1 and C^2 -convergence to weak K.A.M. solutions”, with Marie-Claude Arnaud, submitted
(Preprint available at: <https://arxiv.org/abs/1902.06108>)
2. “Essential forward weak KAM solution for the convex Hamilton-Jacobi equation”, with Jianlu Zhang, submitted
(Preprint available at: <https://arxiv.org/abs/2103.07638v1>)

3. “On the existence of solutions for Frenkel-Kontorova models on quasi-crystals”, with Jianxing Du, submitted
(Preprint available at: <https://arxiv.org/abs/2012.15594>)
4. “Convergence of one-dimensional stationary mean-field games with vanishing potential”, with Yiru Cai, Haobo Qi and Yi Tan,submitted....
(Preprint available at: <https://arxiv.org/abs/1805.11068>)
5. “Assigned distance-like functions and the induced quotient metric space”, with Xiaojun, Cui and Liang Jin, in preparation
(Previous version of preprint available at: <https://arxiv.org/abs/1911.08741>)
6. “Lipschitz sub-actions for locally maximal hyperbolic sets and non-invertible C^1 maps or C^2 flows”, with Philippe Thieullen and Wenzhe Yu, in preparation
7. “Variational and hyperbolic shadowing in a priori unstable Hamiltonian systems”, with Rafael de la Llave, in preparation
8. “Minimizers of Fibonacci quasi-periodic Frenkel-Kontorova model and dynamical renormalization”, in preparation
9. “Green bundles and the regularity of the weak KAM solutions”, with Philippe Thieullen, in preparation

RESEARCH PLANS

Since the celebrated KAM theory and Aubry-Mather theory describe well the quasi-periodic solutions of Frenkel-Kontorova models on the crystals, it is natural to generalize the analogue of these results for the dynamics of the Frenkel-Kontorova models on the quasi-crystal or aperiodic tiling (e.g. Penrose tiling) first discovered by Dan Shechtman in Chemistry and studied by Yves Meyer using harmonic analysis. This quasi-crystal is more accurate to model the cleaved faces of crystals or quasi-crystals. These quasi-periodic orbits could be studied profitably by combining analytical and computational techniques. I am working on related Aubry-Mather theory and diffusion property. I am trying to carry on some numerical simulations and harmonic analysis and then use the idea of computer-aid proof to obtain the delicate theoretic results.

Another related project we are working on is to develop the theory of classical and viscosity solutions and their singular propagation of more general Hamilton-Jacobi equations and mean field games by employing of dynamical systems—a generalized version of KAM and weak KAM theory and Green bundles.

EDUCATION

2019.8-now

Associate Professor, Beijing Normal University
2019.1-now
Assistant chair
2013.8-2019.7
Assistant Professor, Beijing Normal University
2014.2-2014.8, 2016.9-2017.2
Postdoc, IMB, University of Bordeaux
Advisor: Prof. Philippe Thieullen
2011.9-2013.6
Postdoc, Academy of Mathematics and Systems Science, Chinese Academy of Sciences
Advisor: Prof. Zaijiu Shang
2005.9-2011.9
Ph.D., Department of Mathematics, Nanjing University
Advisors: Prof. Chongqing Cheng, Prof. Rafael de la Llave
2009.3-2011.4
Visiting Student at the University of Texas at Austin
Advisors: Prof. Rafael de la Llave, Prof. Chongqing Cheng
2008.9-2008.12
Visiting Student in Centre de Recerca Matematica for the Program-Stability and Instability in Mechanical Systems (SIMS08)
2007.3- 2007.7
Participate in the Workshop on Smooth Ergodic Theory Hosted by Morningside Center of Mathematics, CAS
2000.9-2004.6
Bachelor's Degree, Department of Mathematics, Suzhou University

PROFESSIONAL SERVICE

Referee for:

Nonlinearity
Journal of Differential Equations
Discrete & Continuous Dynamical Systems
Annali di Matematica Pura ed Applicata
Science China Mathematics
Applied Mathematics Letters
Electronic Research Announcements in Mathematical Sciences
International Journal of Bifurcation and Chaos
Boundary Value Problems
Communications in Theoretical Physics

CONFERENCE PARTICIPATION

May 2022

Give a talk at the conference "Weak KAM theory – XXV years later", Avignon, France

Apr. 2021

Give a talk at Online Conference on Dynamical systems, Southeast University

Jul. 2019

- Give a talk at the conference “New trends in Hamilton-Jacobi: PDE, Control, Dynamical Systems and Geometry”, Fudan University
- Jul. 2017
Give a talk at the Theme Sessions of “The 14th International Conference on Free Boundary Problems Theory and Applications”, Shanghai Jiao Tong University
- Jul. 2016
Give a talk at the conference “Workshop on Hamilton-Jacobi equations”, Fudan University
- Oct. 2015
Give an invited talk at Mathematisches Forschungsinstitut Oberwolfach, Germany
- Jul. 2014
Give a talk at the conference “The 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications”, Madrid
- Apr. 2014
Visit Mathematical Department of University of Groningen
- Mar. 2013
Give an invited talk at the conference “First International Conference on Dynamics of Differential equations” at Georgia Institute of Technology and visit School of Mathematics of Georgia Tech
- Sep. 2012
Participate in ERC Workshop on Geometric Partial Differential Equations at Centro De Giorgi, Pisa
- Dec. 2011
Give a talk at the conference “Dynamical Optimization in PDE and Geometry Applications to Hamilton-Jacobi Ergodic Optimization, Weak KAM” at Université Bordeaux 1
- Jan. 2011
Visit Mathematical Department of Duke University
- Jun. 2010
Participate in 2010 CNA Summer School-New Vistas in Image Processing and PDEs at Carnegie Mellon University
- Apr. 2010
Participate in the Conference on Celestial Mechanics and Hamiltonian Systems at the University of Maryland
- Oct. 2009
Participate in VIII Americas Conference on Differential Equations
- Feb. 2007
Participate in the 4th Winter School in Dynamical Systems of the DANCE
- Jul. 2006-Aug. 2006
Participate in the 11th National Summer School in Mathematics Hosted at the Chinese University of Hong Kong.
- Jun. 2006
Participate in the Nanjing Conference on Hamiltonian Dynamics