

# Curriculum Vitae

Pengfei Zhang

## Contact Information

Department of Mathematics  
University of Oklahoma  
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## Education

B.S. University of Science and Technology of China 2002 – 2006  
Ph.D. University of Science and Technology of China 2006 – 2011  
Thesis: *From Uniform Hyperbolicity to Differentiable Self-maps*  
Advisors: X. Ye, W. Huang, Z. Xia (Northwestern University)

## Research Experiences

Northwestern University 2008 – 2010  
Peking University 2010 – 2011

## Professional Experiences

University of Oklahoma	Associate Professor		2023 – present
University of Oklahoma	Assistant Professor		2017 – 2023
University of Mississippi	Visiting Assistant Professor	(S. Kocić)	2015 – 2017
University of Houston	Research Associate	(H.K. Zhang)	2014 – 2015
UMass Amherst	Visiting Assistant Professor	(H.K. Zhang)	2012 – 2014
Peking University	Postdoc	(L. Wen)	2011 – 2012

## Visiting Positions

Boston University Lecturer Fall 2023

## Teaching Experiences

- (1) **Undergraduate Courses:** Calculus & Multivariate Calculus, Discrete Math, Differential Geometry, Fourier Transform, Ordinary Differential Equations, Physical Math, Partial Differential Equations, General Topology.
- (2) **Graduate Courses:** Complex Analysis I, Geometry I (Smooth Manifolds), Geometry II (Riemannian Manifolds), Equilibrium States and Ergodic Theory of Anosov Diffeomorphisms, Stochastic Processes, Topics in Analysis (Holomorphic Functional Calculus).

## Research Interests

- Smooth ergodic theory, chaotic billiards and geodesic flows.
- Generic properties,  $C^r$ -closing and connecting problems.
- Hamiltonian dynamical systems, symplectic and contact dynamics.
- Statistical properties of dynamical systems, decay of correlations.

## Publications

- (1) P. Zhang. Homoclinic intersections of symplectic partially hyperbolic systems with 2D center. *Dynamical Systems*, to appear, 2023.
- (2) X. Jin, P. Zhang. Homoclinic and heteroclinic intersections for lemon billiards. *Advances in Math.* 442, April 2024, 109588.
- (3) X. Jin, P. Zhang. Birkhoff Normal Form and Twist coefficients of periodic orbits of billiards. *Nonlinearity* 35 (8) (2022), 3907–3943.
- (4) F. Wang, H.-K. Zhang, P. Zhang. Decay of correlations for unbounded observables. *Nonlinearity* 34 (4) (2021), 2402–2429.
- (5) X. Jin, P. Zhang. Hyperbolicity of asymmetric lemon billiards. *Nonlinearity* 34 (1) (2021), 92–117.
- (6) Z. Xia, P. Zhang. Homoclinic intersections for geodesic flows on convex spheres. *Contemporary Math.* 698 (2017), 221–238.
- (7) R. Yan, S. Gan, P. Zhang. Accessibility and homology bounded strong unstable foliation for Anosov diffeomorphisms on 3-torus. *Acta Math. Sinica* 33 (2017), 71–76.
- (8) P. Zhang. Convex billiards on convex spheres. *Ann. Inst. H. Poincaré Anal. Non Linéaire*, 34 (2017), 793–816.
- (9) L. Bunimovich, H.-K. Zhang, P. Zhang. On another edge of defocusing: hyperbolicity of asymmetric lemon billiards. *Comm. Math. Phys.* 341 (2016), 781–803.
- (10) Z. Xia, P. Zhang. Homoclinic points for convex billiards. *Nonlinearity* 27 (2014), 1181–1192.
- (11) P. Zhang. Fundamental domain of invariant sets and applications. *Ergod. Th. Dynam. Syst.* 34 (2014), no. 1, 341–352.
- (12) N. Chernov, H.-K. Zhang, P. Zhang. Electrical current in Sinai billiards under general small forces. *J. Stat. Phys.* 153 (2013), no. 6, 1065–1083.
- (13) J. Chen, L. Mohr, H.-K. Zhang, P. Zhang. Ergodicity of the generalized lemon billiards. *Chaos* 23, 043137 (2013).
- (14) P. Zhang. Diffeomorphisms with global dominated splittings can not be minimal. *Proc. Amer. Math. Soc.* 140 (2012), 589–593.
- (15) P. Zhang. Partially hyperbolic sets with positive measure and ACIP for partially hyperbolic systems. *Discrete Contin. Dynam. Syst.* 32 (2012), 1435–1447.
- (16) C. Fang, W. Huang, Y. Yi, P. Zhang. Dimension of stable sets and scrambled sets in positive finite entropy systems. *Ergod. Th. Dynam. Syst.* 32 (2012), no. 2, 599–628 .
- (17) W. Huang, P. Zhang. Pointwise dimension, entropy and Lyapunov exponents for  $C^1$  maps. *Trans. Amer. Math. Soc.* 364 (2012), no. 12, 6355–6370.
- (18) Z. Xia, P. Zhang. Exponential growth rate of paths and its connection with dynamics. *Progress in Variational Methods*, World Scientific, 2010, 212–224.

## Preprints

- (1) P. Zhang. Twist interval for twist maps. arXiv:1805.11086.

## Invited Talks

### • Conferences/Colloquium

- School of Mathematics, South China University of Technology (SCUT), Guangzhou, China, December 22, 2022 (online).
- Conference on Hamiltonian Dynamical Systems and Celestial Mechanics, Capital Normal University, Beijing, China, July 18–22, 2022 (online).
- Houston Workshop on Hyperbolic Dynamical Systems, University of Houston, TX, May 19-22, 2022.
- 83rd Meeting of the Oklahoma-Arkansas Section of MAA, Henderson State University, AR, April 7–9, 2022 (online).
- Department of Mathematics, University of Idaho, December 02, 2021 (online).
- AMS Sectional Meeting, University of South Alabama, Mobile, AL, Nov 20-21, 2021 (online).
- AMS Fall Western Sectional Meeting, UC Riverside, Riverside, CA, Nov 4–5, 2017.

- SIAM Central States Section Meeting, Colorado State University, Fort Collins, CO, Sept 29–Oct 01, 2017.
- Department of Mathematics, University of Oklahoma, February 14, 2017.
- Statistical Properties of Nonequilibrium Dynamical Systems, SUSTech, July 27–August 2, 2016.
- Department of Mathematics and Statistics, University of Toledo, April 22, 2016.
- Department of Physics and Astronomy, University of Mississippi, April 5, 2016.
- Dynamical Systems, Ergodic Theory and Probability Conference, University of Alabama at Birmingham, May 18–20 2015.
- Special Session on Dynamical Systems, AMS Sectional Meeting, Michigan State University, March 14–15, 2015.
- Department of Mathematics, University of Mississippi, October 27, 2014.
- Young Mathematician Form, Beijing International Center for Mathematical Research, June 18–21, 2013.
- Special Session on Dynamical Systems, AMS Sectional Meeting, University of Mississippi, March 1–3, 2013.
- Semi-annual Workshop in Dynamical Systems and Related Topics, Penn State University, October 11–14, 2012.
- School and Conference in Dynamical Systems, International Centre for Theoretical Physics, Italy, 21 May–8 June, 2012.
- Measurable and Topological Dynamics and Related Topics, Huangshan, China, June 20–26, 2011.

- **Seminar Talks**

- Ergodic Theory Seminar, University of California Riverside, May 06, 2024.
- Dynamical System Seminar, Tufts University, February 27, 2024.
- Dynamical System Seminar, University of Oklahoma, November 02, 2022.
- Analysis & Math Physics Seminar, Virginia Tech, September 17, 2022 (online).
- Dynamical System Seminar, University of Oklahoma, September 7, 2022.
- Dynamical System Seminar, University of Oklahoma, November 03, 2021 (online).
- Symplectic Dynamical System Seminar, SUSTech, July 2020 (online).
- Dynamical System Seminar, University of Oklahoma, April 15, 2020 (online).
- Grad Student Seminar, University of Oklahoma, March 04, 2019.
- Dynamical System Seminar, University of Oklahoma, November 07, 2017.
- Geometry & Topology Seminar, University of Oklahoma, October 11, 2017.
- Analysis Seminar, University of Oklahoma, October 02 & 09, 2017.
- Dynamical Systems Seminar, SUSTech, January 12, 2017.
- Dynamical Systems Seminar, Peking University, August 08, 2016.
- Analysis & Dynamical Systems Seminar, University of Mississippi, February 18, 2016.
- Dynamical Systems Seminar, Northwestern University, January 05, 2016.
- Analysis Seminar, University at Buffalo SUNY, April 01, 2015.
- Dynamics Seminar, University of Chicago, January 12, 2015.
- Dynamical Systems Seminar, Brigham Young University, October 23, 2014.
- Dynamical Systems Seminar, University of Houston, October 20, 2014.
- Dynamical Systems Seminar, Peking University, June 2014.
- Dynamical Systems Seminar, Northwestern University, January 14, 2014.
- Applied Analysis and Computation Seminar, UMass Amherst, March 26, 2013.
- Dynamical Systems Seminar, Northwestern University, January 08, 2013.
- Dynamical Systems Seminar, Peking University, March 2011.
- Dynamical Systems Seminar, Peking University, September 2010.
- Graduate Dynamical Systems Seminar, Northwestern University, January 21, 2010.

## Academic Activities

- JMM AMS Special Session on Dynamics, Geometry & Group Actions, Boston, MA, January 4–7, 2023.
- Midwest Dynamical Systems Conference. IUPUI, Indianapolis, IN, November 18–20, 2022.
- Conference on Hamiltonian Dynamical Systems and Celestial Mechanics, Capital Normal University, Beijing, China, July 18–22, 2022 (online).
- Houston Workshop on Hyperbolic Dynamical Systems, University of Houston, TX, May 19–22, 2022.
- Workshop in Dynamical Systems and Related Topics. Penn State University, September 26–29, 2019.
- Midwest Dynamical Systems Meeting. University of Minnesota, Minneapolis, MN, Nov 01–04, 2018.
- KUMUNU PDE, Dynamical Systems and Applications, University of Kansas, Lawrence, KS, April 21–22, 2018.
- AMS Fall Western Sectional Meeting, UC Riverside, Riverside, CA, Nov 4–5, 2017.
- SIAM Central States Section Meeting, Colorado State University, Fort Collins, CO, Sept 29–Oct 01, 2017.
- Workshop on Mathematical Physics Perspective of Billiards and Dominoes, UMass, Amherst, MA, Sept 22–23, 2017.
- Dynamics Beyond Uniform Hyperbolicity, BYU, Provo, UT, June 5–16, 2017.
- Statistical Properties of Nonequilibrium Dynamical Systems, SUSTech, Shenzhen, July 27–August 2, 2016.
- New directions in statistical mechanics and dynamical systems, Princeton University, December 16–17, 2015.
- 114th Statistical Mechanics Conference, Rutgers University, NJ, December 13–15, 2015
- Midwest Dynamical Systems Meeting. Ohio State University, OH, October 30–November 01, 2015.
- Rocky Mountain Dynamical Systems Conference, Brigham Young University, UT, June 8–11, 2015.
- Dynamical Systems, Ergodic Theory and Probability Conference, University of Alabama at Birmingham, AL, May 18–20 2015.
- Special Session on Dynamical Systems, AMS Sectional Meeting. Michigan State University, MI, March 14–15 2015.
- Midwest Dynamical Systems Meeting. University of Michigan, MI, November 7–9, 2014.
- Fourth Abel Conference: A Celebration of Yakov G. Sinai. IMA Special Workshop, MN, October 31–November 02, 2014.
- Workshop in Dynamical Systems and Related Topics. Penn State University, PA, October 16–19, 2014.
- Workshop on Dynamical Systems and Related Topics. University of Maryland, College Park, MD, April 11–13, 2014.
- Workshop in Dynamical Systems and Related Topics. Penn State University, PA, October 17–20 2013.
- Young Mathematician Form. Beijing International Center for Mathematical Research, Beijing, June 18–21, 2013.
- Workshop on Dynamical Systems and Related Topics. University of Maryland, College Park, PA, April 4–7, 2013.
- Special Session on Dynamical Systems, AMS Sectional Meeting. University of Mississippi, MS, March 1–3, 2013.
- Midwest Dynamical Systems Conference. Notre Dame University, IN, October 26–28, 2012.
- Workshop in Dynamical Systems and Related Topics. Penn State University, PA, October 11–14, 2012.
- School and Conference in Dynamical Systems. International Centre for Theoretical Physics, Trieste, Italy, May 21–June 8, 2012.
- International Conference on Measurable and Topological Dynamics and Related Topics. Huangshan, June 20–26, 2011.

- National Summer School on Dynamical systems. Chern Institute of Mathematics, Nankai University, Tianjin, August 9–20, 2010.
- Partially Hyperbolic Dynamical Systems Seminar. Northwestern University, IL, Fall 2009.
- Midwest Dynamical Systems Conference. Indiana University, Bloomington, IN, October 3–5, 2008.
- The 13th National Summer School on Mathematics. University of Science and Technology of China, Hefei, July 14–August 4, 2008.
- Dynamical Systems and Related Topics Workshop. South China Normal University, Guangzhou, December 14–18, 2007.
- Workshop on Liao Theory. Sun Yat-Sen University, Guangzhou, December 10–13, 2007.
- The 2nd National Summer School on Dynamical systems. Jilin University, Jilin, August 1–14, 2007.
- The 1st National Summer School on Dynamical systems. Nanjing University, Jiangsu, June 25–July 8, 2006.

### Awards and Honors

- *MSP Research Support Fund*. UMass Amherst, 2012–2014.
- *Presidential Award*. Chinese Academy of Science, 2011
- *Kwang-Hua Scholarship*. University of Science and Technology of China, 2010.
- *Scholarship for Overseas Study*. Chinese Scholarship Council, 2008–2010.
- *Honorable Award*. National Summer School on Dynamical Systems, Nanjing University, 2006.

### Academic Services

- Organizers: *Dynamics Seminars*, Peking University, 07/2010 – 08/2012;  
*Analysis Seminars*, University of Oklahoma, 09/2017 – 08/2022;  
*Analysis Coordinator*, 09/2020 – 05/2023.
- Committees: Math Club, 08/2017 – 07/2019;  
Grad Committee, 08/2018 – 07/2019;  
Undergrad Awards, 08/2019 – 07/2022;  
Undergrad Committee, 08/2019 – 07/2023;  
First Year Math, 08/2021 – 07/2023;  
Syllabi Preparation, 08/2021 – 07/2023;  
Strategic Planning, 01/2022 – 07/2023.
- Reviewers: zbMATH (previous known as Zentralblatt MATH), EMS, since Fall 2012;  
Mathematical Reviews, AMS, since Fall 2016.
- Referees: *Anal. Math. Phys.*,  
*Dynam. Syst.*,  
*Discrete Conti. Dynam. Syst.*,  
*Ergod. Th. Dynam. Syst.*,  
*Eur. J. Phys.*,  
*J. Diff. Equations*,  
*Nonlinearity*,  
*Science China Math.*
- Complex Analysis Test Out Exam, August 2021, University of Oklahoma.
- Comprehensive Exam, Fourier Transforms, April 2022, University of Oklahoma.
- General Exam, Differential Geometry, Fall 2022 and Spring 2023, University of Oklahoma.

- Organizing Committee, The 4th Annual Meeting of SIAM Central States Section, Norman, OK, October 5 – 7, 2018.

## Mentors

- **Undergraduate students**

- (1) Kaleb Neal. Independent Study. *Air Launch to Orbit Optimization*. Spring 2020. (presented at 2020 Undergraduate Research Day)
- (2) Armand Ghosh. Undergraduate Honors Research. *Applications of methods in dynamical systems to some number-theoretic problems*. Fall 2018. (RB Deal Undergraduate Oral Presentation Awards, OK-AR MAA meeting, 2019).

- **PhD Candidates**

- (1) Carlos Villanueva (supervisor): Chaotic Billiards in Riemannian and Finsler Geometry, August 2021 – present.
- (2) Martin Carlson (coadvisor): Geometric Optics in Finsler Geometry, May 2021 – present.

- **Postdoctoral Researchers**

- (1) Jory Griffin, Fall 2019 – July 2022.

## Outreach

- Speaker, Math Club, University of Oklahoma, March 31, 2022.
- Volunteer, Texas Oklahoma Regional Undergraduate Symposium (TORUS), Midwestern State University, Feb 10 2018.
- Volunteer, Math Day, University of Oklahoma, Nov 16 2017.
- Speaker, AMS Graduate Student Seminar, University of Mississippi, May 5, 2017.
- Grader, Math Tournament, University of Mississippi, Oct 17, 2015.
- Speaker, Math Club, UMass Amherst, Nov 13, 2013.