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Jiajun Tong

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Academic Positions

Sept. 2021 – **Assistant Professor**, *Beijing International Center for Mathematical Research (BICMR), Peking University*, China

July 2018 – June 2021 **Hedrick Assistant Adjunct Professor**, *University of California, Los Angeles*, USA
- Mentor: Prof. Inwon C. Kim

Education

Sept. 2013 – May 2018 **Ph.D. in Mathematics**, *Courant Institute, New York University*, USA
- Advisor: Prof. Fang-Hua Lin
- Thesis: On the Stokes Immersed Boundary Problem in Two Dimensions

Sept. 2009 – July 2013 **B.S. in Applied and Computational Mathematics**, *Peking University*, China
- Advisor: Prof. Pingwen Zhang
- Thesis: Mean-Field Simulations of Quasicrystalline Phases in ABC Star Block Terpolymer Systems

Research Interests

Partial differential equations and applied analysis, especially evolution free boundary problems, PDEs in fluid dynamics, and calculus of variations.

Publications

[1] De Huang and Jiajun Tong. Steady contiguous vortex-patch dipole solutions of the 2D incompressible Euler equation. *arXiv preprint arXiv:2406.09849*, 2024. *Submitted*.

[2] Jiajun Tong and Yuming Paul Zhang. Convergence of free boundaries in the incompressible limit of tumor growth models. *arXiv preprint arXiv:2403.05804*, 2024. *Submitted*.

[3] Jiajun Tong and Dongyi Wei. Geometric properties of the 2-D Peskin problem. *arXiv preprint arXiv:2304.09556*, 2023. *Submitted*.

[4] De Huang, Jiajun Tong, and Dongyi Wei. On self-similar finite-time blowups of the De Gregorio model on the real line. *Communications in Mathematical Physics*, 402:2791–2829, 2023.

[5] Jiajun Tong. Global solutions to the tangential Peskin problem in 2-D. *Nonlinearity*, 37(1):015006, 2024.

[6] Matt Jacobs, Inwon Kim, and Jiajun Tong. Tumor growth with nutrients: Regularity and stability. *Communications of the American Mathematical Society*, 3:166–208, 2023.

[7] Matt Jacobs, Inwon Kim, and Jiajun Tong. Darcy's law with a source term. *Archive for Rational Mechanics and Analysis*, 239(3):1349–1393, 2021.

[8] Matt Jacobs, Inwon Kim, and Jiajun Tong. The L^1-contraction principle in optimal transport. *The Annali della Scuola Normale Superiore di Pisa, Classe di Scienze*, XXIII:1871–1919, 2022.

[9] Inwon Kim and Jiajun Tong. Interface dynamics in a two-phase tumor growth model. *Interfaces and Free Boundaries*, 23(2):191–304, 2021.

[10] Zhiyuan Geng and Jiajun Tong. Regularity of minimizers of a tensor-valued variational obstacle problem in three dimensions. *Calculus of Variations and Partial Differential Equations*, 59, 57, 2020.

[11] Jiajun Tong. Regularized Stokes immersed boundary problems in two dimensions: Well-posedness, singular limit, and error estimates. *Communications on Pure and Applied Mathematics*, 74(2):366–449, 2021.

[12] Jiajun Tong and Michael J. Shelley. Directed migration of microscale swimmers by an array of shaped obstacles: modeling and shape optimization. *SIAM Journal on Applied Mathematics*, 78(5):2370–2392, 2018.

[13] Zaihui Gan, Fang-Hua Lin, and Jiajun Tong. On the viscous Camassa-Holm equations with fractional diffusion. *Discrete & Continuous Dynamical Systems - A*, 40(6):3427–3450, 2020.

[14] Fang-Hua Lin and Jiajun Tong. Solvability of the Stokes immersed boundary problem in two dimensions. *Communications on Pure and Applied Mathematics*, 72(1):159–226, 2019.

[15] Megan S. Davies Wykes, Xiao Zhong, Jiajun Tong, Takuji Adachi, Yanpeng Liu, Leif Ristroph, Michael D. Ward, Michael J. Shelley, and Jun Zhang. Guiding microscale swimmers using teardrop-shaped posts. *Soft Matter*, 13:4681–4688, 2017.

[16] Kai Jiang, Jiajun Tong, and Pingwen Zhang. Stability of soft quasicrystals in a coupled-mode Swift-Hohenberg model for three-component systems. *Communications in Computational Physics*, 19(3):559–581, 2016.

[17] Kai Jiang, Jiajun Tong, Pingwen Zhang, and An-Chang Shi. Stability of two-dimensional soft quasicrystals in systems with two length scales. *Physical Review E*, 92(4):042159, 2015.

Grants

National Key R&D Program of China, No. 2021YFA1001500, Principal Investigator, Dec. 2021 - Nov. 2026

Honors and Awards

2023 Peking University Boya Young Fellow, PKU

Apr. 2019 Best Poster Award, Southern California Applied Mathematics Symposium (SOCAMS 2019)

2017 - 2018 Dean's Dissertation Fellowship, Graduate School of Arts and Science, NYU

2013 - 2017 *Henry M. MacCracken* Fellowship, Graduate School of Arts and Science, NYU

July 2013 Outstanding Graduate in Beijing

Aug. 2012 Gold Medalist in Team Contest, and Silver Medalist in Individual Contest of Applied and Computational Mathematics, S.-T. Yau College Student Mathematics Contests

Seminars and Conferences Organized

Dec. 2023 Recent Advances in Fluid Dynamics: Singularity, Regularity and Mixing, Duke Kunshan University

Sep. 2021- PDE/Analysis Seminar, BICMR

Talks

Aug. 2024 Analysis and PDE Seminar, Zhejiang University

Apr. 2024 PDE Seminar, Fudan University

Apr. 2024 Conference on Analysis in Fluids, Kinetic Theory, and Waves, Fuzhou University

Mar. 2024 Miniworshop on Partial Differential Equations, Capital Normal University

Nov. 2023 Online Workshop on PDEs in Applications (virtual), Fudan University

Nov. 2023 Workshop on Advances in PDEs, Beihang University

Nov. 2023 2nd Workshops on Mathematical Fluid Dynamics, Westlake University

Oct. 2023 PDE Seminar, Shanghai Jiao Tong University

June 2023 PDE Seminar, Morningside Center of Mathematics, Chinese Academy of Sciences

May 2023 PDE Seminar Series, NYU-ECNU Institute of Mathematical Sciences at NYU Shanghai

Oct. 2022 New Trends in Mathematical Biology (virtual), Duke Kunshan University

Oct. 2022 Workshop on Analysis and PDEs (virtual), Shanghai Jiao Tong University

June 2022 Analysis Research Interaction Team Seminar, Beijing International Center for Mathematical Research, Peking University

Dec. 2021 PDE Seminar (virtual), University of Electronic Science and Technology of China

Dec. 2021 PDE Seminar, Academy of Mathematics and Systems Science, Chinese Academy of Sciences

Dec. 2021 Workshop on Nonlinear PDE Theory and Applications (virtual), Capital Normal University

Oct. 2021 Hua Loo-Keng Youth Lecture in Mathematics, Academy of Mathematics and Systems Science, Chinese Academy of Sciences

May 2021 Seminar (virtual), Zhejiang University

Dec. 2020 2020 Winter Young Mathematician Forum at Shanghai Jiao Tong University (virtual)

Dec. 2020 Seminar (virtual), Fudan University

Nov. 2020 Seminar (virtual), National University of Singapore

Nov. 2020 PDE/Analysis Seminar (virtual), Beijing International Center for Mathematical Research, Peking University

Oct. 2020 Analysis of Fluids and Related Topics Seminar (virtual), Princeton University

Sep. 2020 PDE Seminar (virtual), Purdue University

Sep. 2020 Young Mathematician Lecture Series (virtual), National University of Singapore

Feb. 2020 Analysis and PDE Seminar, UCLA

Dec. 2019 SIAM Conference on Analysis of Partial Differential Equations (PD19)

Nov. 2019 Participating Analysis Seminar, UCLA

May 2019 Applied and Computational Mathematics Seminar, University of Wisconsin – Madison

Feb. 2018 Applied Mathematics Colloquium, Columbia University

Jan. 2018 Geometry & Analysis Seminar, Columbia University

Jan. 2018 Participating Analysis Seminar, UCLA

Nov. 2017 PDE Seminar, NYU-ECNU Institute of Mathematical Sciences at NYU Shanghai

Oct. 2017 PDE Seminar, Zhejiang University

Oct. 2017 2017 Fall Program on Analysis of PDE (Week 6), Shanghai Center for Mathematical Sciences, Fudan University

Nov. 2016 69th Annual Meeting of the APS Division of Fluid Dynamics

Teaching

PKU

Fall 2024 Advanced Mathematics A (I)

Spring 2024 Mathematical Analysis (II)

Fall 2023 Mathematical Analysis (III), and 3+X Undergraduate Seminar (joint with De Huang)

Spring 2023 Topics in Analysis and PDE: Free Boundary Problems

Fall 2022 Advanced Mathematics A (I)

Spring 2022 Advanced Mathematics A (II)

UCLA

Spring 2021 Math 131A Analysis (Lec 1), and Math 135 Ordinary Differential Equations (Lec 2)

Winter 2021 Math 134 Linear and Nonlinear Systems of Differential Equations (Lec 1)

Fall 2020 Math 135 Ordinary Differential Equations (Lec 3)

Spring 2020 Math 136 Partial Differential Equations (Lec 1)

Winter 2020 Math 151A Applied Numerical Methods (Lec 1 & 2)

Fall 2019 Math 151A Applied Numerical Methods (Lec 1)

Spring 2019 Math 151A Applied Numerical Methods (Lec 1)

Winter 2019 Math 132H Complex Analysis (Honors) (Lec 1)

Fall 2018 Math 151A Applied Numerical Methods (Lec 1 & 2)

Mentoring

PKU *Undergraduates*

Xiaopeng Zheng (since Spring 2024)

Zirui Wang (since Fall 2023)

Haoran Liu (since Fall 2023)

Jiehui Zhai (Fall 2023 – Spring 2024, Mathematical Theory of Mean-field Games)

Yao Liu (Spring 2022 – Spring 2024, Analysis of Fluid-structure Interaction Problems)

UCLA *Undergraduates*

Mingxin Li (Winter 2021, Real Analysis; Spring 2021, Numerical Analysis of Free Boundary Problems in Fluid Dynamics)

Jiayun Meng (Spring 2020, Real Analysis; Summer 2020, Complex Analysis and Functional Analysis; Spring 2021, Free Boundary Problems in Fluid Dynamics)

Xu Tang (Spring 2019, Basics of Monte Carlo Method)