

Taiyang XU / 徐太阳

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Employment

Fudan University / 复旦大学 Shanghai, China
Postdoctoral Researcher in the Department of Mathematics 2024 - Present
Mentor: [Lun Zhang](#)

Education

Fudan University / 复旦大学 Shanghai, China
Ph.D. in Mathematics 2019 - 2024
Thesis: *On the long-time asymptotics of the local and nonlocal mKdV equation under the nonzero background / 非零背景下局域和非局域 mKdV 方程-解的长时间渐近分析*
Mentor: [Engui Fan](#)

China University of Mining and Technology / 中国矿业大学 Xuzhou, Jiangsu Province, China
B.Sc. in Mathematics, Distinguished Honor 2015 - 2019
Thesis: *Inverse scattering theory and integrability on several kinds of nonlinear evolution equations / 几类非线性发展方程的反散射方法及其可积性质的研究*
Thesis advisor: [Shoufu Tian](#)

Research Interests

Integrable PDEs, Random matrices theory, Determinantal point processes, Orthogonal polynomials, Asymptotic analysis, Riemann-Hilbert (RH) problems, Special functions, Painlevé equations.

Research Articles

Preprints

1. Painlevé transcendents in the defocusing mKdV equation with non-zero boundary conditions (with Zhaoyu Wang and Engui Fan) ([arXiv:2306.07073](#)).

2. Soliton resolution and asymptotic stability of N -soliton solutions for the defocusing mKdV equation with finite density type initial data (with Engui Fan and Zechuan Zhang) ([arXiv:2108.03650](#)).

Publications in refereed journals

1. Transient asymptotics of the modified Camassa-Holm equation (with Yiling Yang and Lun Zhang) **Journal of the London Mathematical Society**, 110 (2024), e12967. ([DOI: 10.1112/jlms.12967](#)) ([arXiv:2308.06950](#))
2. On the Cauchy problem of defocusing mKdV equation with finite density initial data: long-time asymptotics in soliton-less regions (with Engui Fan and Zechuan Zhang) **Journal of Differential Equations**, 372 (2023), 55-122. ([DOI: 10.1016/j.jde.2023.06.038](#)) ([arXiv:2108.06284](#))
3. Large-time asymptotics to the focusing nonlocal modified Kortweg-de Vries equation with step-like boundary conditions (with Engui Fan) **Studies in Applied Mathematics**, 150 (2023), 1217-1273. ([DOI: 10.1111/sapm.12568](#)) ([arXiv:2208.01268](#))
4. Riemann-Hilbert approach for multisoliton solutions of generalized coupled fourth-order nonlinear Schrödinger equations (with Weiqi Peng and Shoufu Tian) **Mathematical Methods in the Applied Sciences**, 43 (2020), 865-880. ([DOI: 10.1002/mma.5964](#))

Fellowships and Grants

- Shanghai Post-doctoral Excellence Program, 2024–2026. / 上海市超级博士后项目.
“*Riemann-Hilbert Method for Several Asymptotic Problems related to Universality from Integrable Systems and Random Matrix Theory*” / “可积系统和随机矩阵理论中若干渐近问题的普适性探索：黎曼-希尔伯特方法”
Role: Host / 主持
- China Postdoctoral Science Foundation (Certificate No. 2024M760480), 2024-2026. / 中国博士后科学基金第 76 批面上资助.
“*Semiclassical Asymptotics and Universality for Nonlinear Integrable Shallow Water Wave Systems*” / “非线性可积浅水波系统的半经典渐近与普适性”
Role: Host / 主持

Teaching Activities

- Spring, 2024: TA of Methods of Asymptotic Analysis (MATH630117), Fudan University.
- Fall, 2021: TA of Calculus A (MATH120021.02), Fudan University.
- Spring, 2020: TA of Calculus B (MATH120004.01), Fudan University (Online).
- Fall, 2019: TA of Calculus B (MATH120003.01), Fudan University.

Scholarships and Awards

Doctorate

- Graduation with Honors (Shanghai Outstanding Graduate), 2024. / 上海市优秀毕业生 (研究生).
- Scholarship provided by Huatai Securities Technology, 2023. / 华泰证券科技奖学金.
- Scholarship provided by Pacific Insurance Company, 2022. / 太平洋保险奖学金.
- Outstanding Doctoral Candidate Scholarship provided by Fudan University, 2021. / 优秀博士候选人奖学金.
- Doctoral Scholarship of the Year provided by Fudan University, 2019-2023. / 博士生学年学业奖学金.

Undergraduate

- Outstanding Undergraduates in China University of Mining and Technology, 2015-2019. / 中国矿业大学优秀毕业生.

Seminars

Seminars on Random Matrix Theory and Integrable Systems in Fudan during 2019–2026

(Here I only list the talks given by myself.)

- *Fredholm determinants from Schrödinger type equations, and deformation of Tracy-Widom distribution*, Oct, 2024.
- *Biorthogonal measures, polymer partition functions, and random matrices*, April, 2024.
- *Painlevé type asymptotics for the Camassa-Holm equation*, Oct, 2022.
- *A Riemann-Hilbert approach to Fredholm determinants of Hankel composition operators: scalar-valued kernels*, Sept - Oct, 2022.
- *Primitive potentials and bounded solutions of the KdV equation*, Sept, 2022.
- *Soliton V. The gas: Fredholm determinants, analysis and the rapid oscillations behind the kinetic equation*, May - June, 2022.

- *Airy kernel determinant solutions to the KdV equation and integro-differential Painlevé equations*, Dec, 2021 and Mar, 2022.
- *The defocusing nonlinear Schrödinger equation with step-like oscillatory initial data*, Oct, 2021.
- *Momenta spacing distributions in anharmonic and the higher order finite temperature Airy kernel*, Oct, 2021.
- *Long-Time behavior of the non-focusing nonlinear Schrödinger equation – a case study*, April, 2021.
- *On the origins of Riemann-Hilbert problems in mathematics*, Nov, 2020 and Mar, 2021.

Conferences

(* indicates that I gave a talk.)

- [Random Matrices and Related Topics](#), Jeju island, Korea, 6-10 May, 2024.
- *[The 15th Hemudu Forum on Integrable Systems](#), Ningbo, China, 24–26 Nov, 2023.
- [Foundations of Computational Mathematics 2023 \(FoCM2023\)](#), Paris, France, 12–21 June, 2023.
- [The 13rd Hemudu Forum on Integrable Systems](#), Ningbo, China, 15 - 17 Oct, 2021.

Summer School

- [Random Matrix Summer School](#), University of Michigan, Ann Arbor, USA, 17-28 June, 2024.