

# Taiyang Xu

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<b>Current position</b>	<b>Fudan University</b> , Shanghai, China Department of Mathematics Postdoctoral Fellow (Mentor: Prof. Lun Zhang)	07/2024 – now
<b>Education</b>	<b>Fudan University</b> , Shanghai, China Ph.D. in Mathematics, supervisor Prof. Engui Fan Thesis title: “ <i>On the long-time asymptotics of the local and nonlocal mKdV equation under the nonzero background</i> ”	09/2019 – 06/2024
	<b>China University of Mining and Technology</b> , Xuzhou, China B.Sc. in Mathematics, Distinguished Honor Thesis title: “ <i>Inverse scattering theory and integrability on several kinds of nonlinear evolution equations</i> ”	09/2015 – 06/2019
<b>Research interests</b>	Integrable PDEs, Random matrices theory, Determinantal point processes, Orthogonal polynomials, Asymptotic analysis, Riemann-Hilbert (RH) problems, Special functions, Painlevé equations.	
<b>Publications</b>	<b>Preprints</b> <ol style="list-style-type: none"><li>1. Confluent hypergeometric kernel determinant on multiple large intervals (with Lun Zhang and Zhengyang Zhao) <i>arXiv:2508.10463</i></li><li>2. On the large-time asymptotics of the defocusing mKdV equation with step-like initial data (with Yidan Zhang) <i>arXiv:2204.01299</i></li></ol> <b>Publications in refereed journals</b> <ol style="list-style-type: none"><li>1. Painlevé transients in the defocusing mKdV equation with non-zero boundary conditions (with Engui Fan and Zhaoyu Wang) <i>Communications in Mathematical Physics</i>, 406 (2025), 181.</li><li>2. Soliton resolution and asymptotic stability of <math>N</math>-soliton solutions for the defocusing mKdV equation with a non-vanishing background (with Engui Fan and Zechuan Zhang) <i>Physica D: Nonlinear Phenomena</i>, 472 (2025), 134526.</li><li>3. Transient asymptotics of the modified Camassa-Holm equation (with Yiling Yang and Lun Zhang) <i>Journal of the London Mathematical Society</i>, 110 (2024), e12967.</li><li>4. 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) <i>Journal of Differential Equations</i>, 372 (2023), 55–122.</li><li>5. Large-time asymptotics to the focusing nonlocal modified Kortweg-de Vries equation with step-like boundary conditions (with Engui Fan) <i>Studies in Applied Mathematics</i>, 150 (2023), 1217–1273.</li><li>6. Riemann-Hilbert approach for multisoliton solutions of generalized coupled fourth-order nonlinear Schrödinger equations (with Weiqi Peng and Shoufu Tian) <i>Mathematical Methods in the Applied Sciences</i>, 43 (2020), 865–880.</li></ol>	

<b>Grants</b>	<ul style="list-style-type: none"> <li>- Shanghai Post-doctoral Excellence Program (Grant No. 2024100)                    07/2024 – 07/2026 Project: Riemann-Hilbert method for several asymptotic problems related to universality from integrable systems and random matrix theory Role: Principal Investigator</li> <li>- China Postdoctoral Science Foundation (Grant No. 2024M760480)                    07/2024 – 07/2026 Project: Semiclassical asymptotics and universality for nonlinear integrable shallow water wave systems Role: Principal Investigator</li> </ul>
<b>Teaching activities</b>	<b>09/2019 – 07/2026 @Fudan</b> <ul style="list-style-type: none"> <li>- Fall, 2025: Recitation &amp; Tutorial Instructor of Mathematical Analysis III (MATH130001.04).</li> <li>- Spring, 2024: TA of Methods of Asymptotic Analysis (MATH630117).</li> <li>- Fall, 2021: TA of Calculus A (MATH120021.02).</li> <li>- Spring, 2020: TA of Calculus B (MATH120004.01) (Online).</li> <li>- Fall, 2019: TA of Calculus B (MATH120003.01).</li> </ul>
<b>Scholarships and awards</b>	<p><b>09/2019 – 06/2024 @Fudan (Doctorate)</b></p> <ul style="list-style-type: none"> <li>- Shanghai Outstanding Graduate (Graduation with Honors), 2024.</li> <li>- Huatai Securities Science and Technology Scholarship, 2023.</li> <li>- Pacific Insurance Company Scholarship, 2022.</li> <li>- Outstanding Doctoral Candidate Scholarship, Fudan University, 2021.</li> <li>- Fudan University Doctoral Scholarship, 2019–2023.</li> </ul> <p><b>09/2015 – 06/2019 @CUMT (Undergraduate)</b></p> <ul style="list-style-type: none"> <li>- Outstanding Undergraduates in China University of Mining and Technology, 2019.</li> </ul>
<b>Research talks</b>	<ul style="list-style-type: none"> <li>- “<i>Dubrovin’s conjecture for the Camassa-Holm equation</i>” (invited), 3rd Workshop on Integrable Systems and Random Matrix Theory 2026, Dongguan, China, 4–17 Jan, 2026.</li> <li>- “<i>Confluent hypergeometric kernel determinant on multiple large intervals</i>” (invited), Bielefeld-Melbourne-Seoul Online Random Matrix Seminar, 15th Oct, 2025.</li> <li>- “<i>Confluent hypergeometric kernel determinant on multiple large intervals</i>” (contributed), 5th ZIF Summer School “Randomness in Physics and Mathematics: From Thermalisation in Quantum Systems to Random Matrices”, Universität Bielefeld, Bielefeld, Germany, 25 Aug–6 Sep, 2025.</li> <li>- “<i>An introduction to Dubrovin’s universality conjecture for integrable PDEs, and some progress on the Camassa-Holm equation</i>” (invited), Seminar @UCLouvain, Louvain-la-Neuve, Belgium, 21 Aug, 2025.</li> <li>- “<i>Transient asymptotics of the modified Camassa-Holm equation</i>” (invited), The 2nd Workshop on Integrable Systems and Random Matrix Theory, Dongguan, China, 5–17 Jan, 2025.</li> <li>- “<i>Integrable PDEs with nonzero boundary conditions: large-time asymptotics</i>” (contributed), The 15th Hemudu Forum on Integrable Systems, Ningbo, China, 24–26 Nov, 2023.</li> </ul>
<b>Other presentations</b>	<p><b>Outreach talks</b></p> <ul style="list-style-type: none"> <li>- “<i>Some asymptotic problems in mathematical physics</i>” (invited), Shanghai Institute of Technical Physics, Shanghai, China, 29th Apr, 2025.</li> </ul> <p><b>09/2019 – 07/2026 @Fudan Integrable Systems and Random Matrix Theory Seminar</b></p> <ul style="list-style-type: none"> <li>- “<i>Fredholm determinants from Schrödinger type equations, and deformation of Tracy-Widom distribution</i>” (reading report), Oct, 2024.</li> <li>- “<i>Biorthogonal measures, polymer partition functions, and random matrices</i>” (reading report), Apr, 2024.</li> </ul>

	<ul style="list-style-type: none"> <li>- “Painlevé type asymptotics for the Camassa-Holm equation” (reading report), Oct, 2022.</li> <li>- “A Riemann-Hilbert approach to Fredholm determinants of Hankel composition operators: scalar-valued kernels” (reading report), Sept – Oct, 2022.</li> <li>- “Primitive potentials and bounded solutions of the KdV equation” (reading report), Sept. 2022.</li> <li>- “Soliton V. The gas: Fredholm determinants, analysis and the rapid oscillations behind the kinetic equation” (reading report), May – Jun, 2022.</li> <li>- “Airy kernel determinant solutions to the KdV equation and integro-differential Painlevé equations” (reading report), Mar, 2022.</li> <li>- “The defocusing nonlinear Schrödinger equation with step-like oscillatory initial data” (reading report), Oct, 2022.</li> <li>- “Momenta spacing distributions in anharmonic and the higher order finite temperature Airy kernel” (reading report), Oct, 2022.</li> <li>- “Long-Time behavior of the non-focusing nonlinear Schrödinger equation – a case study” (reading report), Apr, 2022.</li> <li>- “On the origins of Riemann-Hilbert problems in mathematics ” (reading report), Mar, 2022.</li> </ul>
<b>Co-organized activities</b>	<ul style="list-style-type: none"> <li>- (with Lun Zhang) Weekly RMT seminar @Fudan, 09/2022 – now.</li> <li>- (with Engui Fan, Zhaoyu Wang, Yiling Yang and Lun Zhang) Workshop on Integrable Systems, Fudan University, Shanghai, China, 28 Nov, 2025.</li> <li>- (with Lun Zhang) Mini-workshop on Asymptotic Analysis, Fudan University, Shanghai, China, 5–9 Jun, 2025.</li> </ul>
<b>Attended activities</b>	<ul style="list-style-type: none"> <li>- 3rd Workshop on Integrable Systems and Random Matrix Theory 2026, Dongguan, China, 4–17 Jan, 2026.</li> <li>- 5th ZiF Summer School “Randomness in Physics and Mathematics: From Thermalisation in Quantum Systems to Random Matrices”, Universität Bielefeld, Bielefeld, Germany, 25 Aug–6 Sep, 2025.</li> <li>- Universality, Nonlinearity, and Integrability, In honor of Percy Deift, Seoul, Korea, 12–16 May, 2025.</li> <li>- The 2nd Workshop on Integrable Systems and Random Matrix Theory, Dongguan, China, 5–17 Jan, 2025.</li> <li>- Random Matrix Summer School, University of Michigan, Ann Arbor, USA, 17–28 Jun, 2024.</li> <li>- Random Matrices and Related Topics, Jeju island, Korea, 6–10 May, 2024.</li> <li>- The 15th Hemudu Forum on Integrable Systems, Ningbo, China, 24–26 Nov, 2023.</li> <li>- Foundations of Computational Mathematics 2023 (FoCM2023), Paris, France, 12–21 Jun, 2023.</li> <li>- Random Matrix EurAsia 2022 (Online), Institute for Mathematical Sciences (IMS), National University of Singapore, Singapore, 18 Apr–13 May, 2022.</li> <li>- The 13rd Hemudu Forum on Integrable Systems, Ningbo, China, 15–17 Oct, 2021.</li> </ul>
<b>Academic visits</b>	<ul style="list-style-type: none"> <li>- 18/08/2025 – 24/08/2025, UCLouvain, Belgium. (Host: Christophe Charlier)</li> <li>- 31/03/2025 – 11/04/2025, Chongqing University, China. (Host: Yiling Yang)</li> </ul> <p>(I greatly appreciate for their warm hospitality)</p>
<b>Editorial activities</b>	Referee to the following journals: <ul style="list-style-type: none"> <li>- Studies in Applied Mathematics</li> </ul>
<b>Status</b>	<b>China – citizen, Married.</b>

**Languages**

- Chinese (native), The Qianwei dialect of Sichuanese (native)
- English

**Computer skills** L<sup>A</sup>T<sub>E</sub>X, Mathematica, Matlab, HTML, C++, Javascript

Monday 5<sup>th</sup> January, 2026