

# Taiyang Xu

## Fudan University

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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> ”  <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> ”	09/2019 – 06/2024  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>Research articles</b>	<b>Preprints</b> <ol style="list-style-type: none"><li><i>Confluent hypergeometric kernel determinant on multiple large intervals</i> (with Lun Zhang and Zhengyang Zhao) Submitted.</li></ol> <b>Publications in refereed journals</b> <ol style="list-style-type: none"><li><i>Painlevé transcendents in the defocusing mKdV equation with non-zero boundary conditions</i> (with Engui Fan and Zhaoyu Wang) Communications in Mathematical Physics, 406 (2025), 181.</li><li><i>Soliton resolution and asymptotic stability of <math>N</math>-soliton solutions for the defocusing mKdV equation with finite density type initial data</i> (with Engui Fan and Zechuan Zhang) Physica D: Nonlinear Phenomena, 472 (2025), 134526.</li><li><i>Transient asymptotics of the modified Camassa-Holm equation</i> (with Yiling Yang and Lun Zhang) Journal of the London Mathematical Society, 110 (2024), e12967.</li><li><i>On the Cauchy problem of defocusing mKdV equation with finite density initial data: long-time asymptotics in soliton-less regions</i> (with Engui Fan and Zechuan Zhang) Journal of Differential Equations, 372 (2023), 55–122.</li><li><i>Large-time asymptotics to the focusing nonlocal modified Kortweg-de Vries equation with step-like boundary conditions</i> (with Engui Fan) Studies in Applied Mathematics, 150 (2023), 1217–1273.</li><li><i>Riemann-Hilbert approach for multisoliton solutions of generalized coupled fourth-order nonlinear Schrödinger equations</i> (with Weiqi Peng and Shoufu Tian) Mathematical Methods in the Applied Sciences, 43 (2020), 865–880.</li></ol>	
<b>Grants</b>	– Shanghai Post-doctoral Excellence Program Grant No. 2024100 “ <i>Riemann-Hilbert Method for Several Asymptotic Problems related to Universality from Integrable Systems and Random Matrix Theory</i> ” Role: Principal Investigator	2024 – 2026

	<ul style="list-style-type: none"> <li>- China Postdoctoral Science Foundation Grant No. 2024M760480  <i>"Semiclassical Asymptotics and Universality for Nonlinear Integrable Shallow Water Wave Systems"</i>  Role: Principal Investigator</li> </ul>	2024 – 2026
<b>Teaching activities</b>	<b>2019 – 2026 @Fudan</b> <ul style="list-style-type: none"> <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>	<b>2019 – 2024 @Fudan (Doctorate)</b> <ul style="list-style-type: none"> <li>- Graduation with Honors (Shanghai Outstanding Graduate), 2024.</li> <li>- Scholarship provided by Huatai Securities Technology, 2023.</li> <li>- Scholarship provided by Pacific Insurance Company, 2022.</li> <li>- Outstanding Doctoral Candidate Scholarship provided by Fudan University, 2021.</li> <li>- Doctoral Scholarship of the Year provided by Fudan University, 2019–2023.</li> </ul> <b>2015 – 2019 @CUMT (Undergraduate)</b> <ul style="list-style-type: none"> <li>- Outstanding Undergraduates in China University of Mining and Technology, 2019.</li> </ul>	
<b>Co-organized activities</b>	<ul style="list-style-type: none"> <li>- (with Lun Zhang) Mini-workshop on Asymptotic Analysis, Fudan University, Shanghai, China, 5th–6th &amp; 9th June, 2025.</li> </ul>	
<b>Attended activities</b>	<ul style="list-style-type: none"> <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.  (Invited talk: <i>"Transient asymptotics of the modified Camassa-Holm equation"</i>)</li> <li>- Random Matrix Summer School, University of Michigan, Ann Arbor, USA, 17–28 June, 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.  (Contributed talk: <i>"Integrable PDEs with nonzero boundary conditions: large-time asymptotics"</i>)</li> <li>- Foundations of Computational Mathematics 2023 (FoCM2023), Paris, France, 12–21 June, 2023.</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>- 31/03/2025 – 11/04/2025, Chongqing University, China. (Host: Yiling Yang)</li> </ul> <p>(I greatly appreciate for their warm hospitality)</p>	

**Other presentations Outreach talks**

- “*Some asymptotic problems in mathematical physics*”, Shanghai Institute of Technical Physics, Shanghai, China, 29th April, 2025.

**2019 – 2026 @Fudan Integrable Systems and Random Matrix Theory Seminar**

- “*Fredholm determinants from Schrödinger type equations, and deformation of Tracy-Widom distribution*” (reading report), Oct, 2024.
- “*Biorthogonal measures, polymer partition functions, and random matrices*” (reading report), April, 2024.
- “*Painlevé type asymptotics for the Camassa-Holm equation*” (reading report), Oct, 2022.
- “*A Riemann-Hilbert approach to Fredholm determinants of Hankel composition operators: scalar-valued kernels*” (reading report), Sept – Oct, 2022.
- “*Primitive potentials and bounded solutions of the KdV equation*” (reading report), Sept. 2022.
- “*Soliton V. The gas: Fredholm determinants, analysis and the rapid oscillations behind the kinetic equation*” (reading report), May – June, 2022.
- “*Airy kernel determinant solutions to the KdV equation and integro-differential Painlevé equations*” (reading report), Mar, 2022.
- “*The defocusing nonlinear Schrödinger equation with step-like oscillatory initial data*” (reading report), Oct, 2022.
- “*Momenta spacing distributions in anharmonic and the higher order finite temperature Airy kernel*” (reading report), Oct, 2022.
- “*Long-Time behavior of the non-focusing nonlinear Schrödinger equation – a case study*” (reading report), April, 2022.
- “*On the origins of Riemann-Hilbert problems in mathematics*” (reading report), Mar, 2022.

**Status**

**China** – citizen

**Languages**

- Chinese (native)
- English

**Computer skills**

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

Wednesday 13<sup>th</sup> August, 2025