# Taiyang XU

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Education

Fudan University Shanghai, China

Ph.D. student 2019 - Present

Thesis: TBA

Academic advisor: Engui Fan and Lun Zhang

## China University of Mining and Technology

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

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**

- [7] Transient asymptotics of the modified Camassa-Holm equation (with Yiling Yang and Lun Zhang) arXiv:2308.06950, submitted.
- [6] Painlevé transcendents in the defocusing mKdV equation with non-zero boundary conditions (with Zhaoyu Wang and Engui Fan)

arXiv:2306.07073, submitted.

[5] On the large-time asymptotics of the defocusing mKdV equation with step-like initial data (with Engui Fan)

arXiv:2204.01299, submitted.

[4] 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, submitted.

## Publications in refereed journals

[3] 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.

[2] 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.

[1] 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.

## Scholarships and Awards

## **Doctorate**

- Huatai Securities Technology Scholarship, 2023.
- Scholarship by Pacific Insurance Company, 2022.
- Outstanding Doctoral Candidate Scholarship of Fudan University, 2021.
- Doctoral Outstanding Academic Year Scholarship of Fudan University, 2019-2023.

## Undergraduate

- Outstanding Undergraduates in China University of Mining and Technology, 2015-2019.

## Teaching Activities

- 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.

## Seminars

## 2022/2023

- Graduate student seminar of IS in FDU (Oct, 2022): *Painlevé type asymptotics for the Camassa-Holm equation*.
- Graduate student seminar of RMT in FDU (Sept Oct, 2022): A Riemann-Hilbert approach to Fredholm determinants of Hankel composition operators: scalar-valued kernels.
- Graduate student seminar of IS in FDU (Sept, 2022): *Primitive potentials and bounded solutions of the KdV equation*, Fudan University.

## 2021/2022

- Graduate student seminar of IS in FDU (May June, 2022): Soliton V. The gas: Fredholm determinants, analysis and the rapid oscillations behind the kinetic equation.
- Graduate student seminar of RMT in FDU (Dec, 2021 and Mar, 2022): Airy kernel determinant solutions to the KdV equation and integro-differential Painlevé equations.
- Graduate student seminar of IS in FDU (Oct, 2021): *The defocusing nonlinear Schrödinger equation with step-like oscillatory initial data.*
- Graduate student seminar of RMT in FDU (Oct, 2021): *Momenta spacing distributions in anharmonic and the higher order finite temperature Airy kernel.*

#### 2020/2021

- − Graduate student seminar of IS in FDU (April, 2021): Long-Time behavior of the non-focusing nonlinear Schrödinger equation − a case study.
- Graduate student seminar of RMT in FDU (Nov, 2020 and Mar, 2021): On the origins of Riemann-Hilbert problems in mathematics.

## Conferences

#### 2023/2024

- The 15th Hemudu Forum on Integrable Systems, Ningbo University, Ningbo, China, 24–26 Nov, 2023. **Talk**: "Integrable PDEs with nonzero (symmetric and asymmetric) boundary conditions: large-time and transient asymptotics"
- Fudan NYU Shanghai Probability Day, Fudan University, Shanghai, 4th November, 2023.

## 2022/2023

– Foundations of Computational Mathematics 2023 (FoCM2023), Sorbonne Université, Paris, France, 12–21 June, 2023.

### 2021/2022

- Random Matrix EurAsia 2022, Institute for Mathematical Sciences (IMS), National University of Singapore, Singapore, 18 April 13 May, 2022. (Online)
- The 13rd Hemudu Forum on Integrable Systems, Ningbo University, Ningbo, China, 15 17 Oct, 2021.