

## Taiyang XU

Room 2104, Guanghua East Main Tower, Fudan University  
220 Handan Rd, Shanghai  
tyxu19@fudan.edu.cn  
<https://taiyangxu.github.io>

### Employment

#### Fudan University

Shanghai, China

*Postdoctoral Researcher* in the Department of Mathematics  
Mentor: *Lun Zhang*

2024 - Present

### Education

#### Fudan University

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*

Mentor: *Engui Fan*

#### 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

[6] Painlevé transcendents in the defocusing mKdV equation with non-zero boundary conditions (with Zhaoyu Wang and Engui Fan)

**arXiv:2306.07073**, submitted.

[5] 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

[4] Transient asymptotics of the modified Camassa-Holm equation (with Yiling Yang and Lun Zhang)

**Journal of the London Mathematical Society**, 110 (2024), e12967.

[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

- Graduation with Honors (Shanghai Outstanding Graduate), 2024.
- Huatai Securities Technology Scholarship, 2023.
- Scholarship by Pacific Insurance Company, 2022.
- Outstanding Doctoral Candidate Scholarship of Fudan University, 2021.
- Outstanding Doctoral Scholarship in the Academic Year of Fudan University, 2019-2023.

### Undergraduate

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

## Teaching Activities

### 2023/2024

- Spring, 2024: Methods of Asymptotic Analysis (MATH630117), Fudan University.

### 2021/2022

- Fall, 2021: TA of Calculus A (MATH120021.02), Fudan University.

### 2019/2020

- Spring, 2020: TA of Calculus B (MATH120004.01), Fudan University (Online).
- Fall, 2019: TA of Calculus B (MATH120003.01), Fudan University.

## Seminars

### 2023/2024

- Graduate student seminar of RMT in FDU (April, 2024): *Biorthogonal measures, polymer partition functions, and random matrices.*

### 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
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### 2023/2024

- Random Matrices and Related Topics, Jeju island, Korea, May 6-10, 2024.
- The 15th Hemudu Forum on Integrable Systems, Ningbo University, Ningbo, China, 24–26 Nov, 2023.
- 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.

### Summer School

#### 2023/2024

- Random Matrix Summer School, University of Michigan, Ann Arbor, USA, June 17-28, 2024.

### Talks and Lectures

#### 2023/2024

- “*Integrable PDEs with nonzero (symmetric and asymmetric) boundary conditions: large-time and transient asymptotics*”, conference talk in the 15th Hemudu Forum on Integrable Systems, Ningbo University, Ningbo, China, 24–26 Nov, 2023.