

YIFAN LIU

Ph.D. Student in Physics | Institute for Solid State Physics, The University of Tokyo

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RESEARCH INTERESTS

Boundary conformal field theory; universal data in microscopic quantum many-body systems; nonunitary and non-Hermitian critical phenomena; biorthogonal conformal dynamics and quantum quenches; finite-size and finite-entanglement scaling; tensor-network and entanglement diagnostics; boundary renormalization-group flows and conformal defects.

EDUCATION

The University of Tokyo

Oct. 2024 - Sep. 2027 (expected)

Ph.D. in Physics, Institute for Solid State Physics

Official supervisor: Kohei Kawabata; former supervisor and academic mentor: Masaki Oshikawa.

The University of Tokyo

Oct. 2022 - Sep. 2024

M.Sc. in Physics, Institute for Solid State Physics

Oshikawa Group.

Nankai University

2018 - 2022

B.Sc. in Physics

Tianjin, China.

PUBLICATIONS AND PREPRINTS

Preprints

Yifan Liu. "Biorthogonal Conformal Dynamics in Non-Hermitian Quantum Quenches." *arXiv:2608.20156* (2026).

arxiv.org/abs/2608.20156.

Yifan Liu, Haruki Shimizu, Dongchang Liu, and Kohei Kawabata. "Extracting Boundary Conformal Data from Periodic Non-

Hermitian Critical Chains." *arXiv:2606.16785* (2026). arxiv.org/abs/2606.16785.

Peer-Reviewed Journal Articles

Yifan Liu, Natalia Chepiga, Yoshiki Fukusumi, and Masaki Oshikawa. "Boundary critical phenomena in the quantum Ashkin-Teller model." *SciPost Physics* 20, 130 (2026). doi.org/10.21468/SciPostPhys.20.5.130.

Jan T. Schneider, Atsushi Ueda, **Yifan Liu**, Andreas M. Läuchli, Masaki Oshikawa, and Luca Tagliacozzo. "Self-congruent point in critical matrix product states: An effective field theory for finite-entanglement scaling." *SciPost Physics* 18, 142 (2025).

doi.org/10.21468/SciPostPhys.18.4.142.

Yifan Liu, Haruki Shimizu, Atsushi Ueda, and Masaki Oshikawa. "Finite-size corrections to the energy spectra of gapless one-dimensional systems in the presence of boundaries." *SciPost Physics* 17, 099 (2024). doi.org/10.21468/SciPostPhys.17.4.099.

Yifan Liu, Jin Wang, Wenhua Li, and Xiaoqing Wen. "Study for a lab-made Moiré pattern-based thread counter." *European Journal of Physics* 42, 034001 (2021). doi.org/10.1088/1361-6404/abc091.

RESEARCH EXPERIENCE

Institute for Solid State Physics, The University of Tokyo

Oct. 2022 - present

Graduate research in theoretical condensed-matter physics and conformal field theory

Research using boundary CFT, conformal perturbation theory, DMRG/MPS, finite-size and finite-entanglement scaling, and biorthogonal conformal methods for non-Hermitian critical systems and quantum quenches.

RESEARCH VISITS

University of Oxford

Planned late 2026

GRASP-supported research visit; host: Natalia Chepiga

Planned collaboration on boundary entanglement and edge-coupling control in incommensurate critical chains using BCFT and DMRG.

Kavli Institute for Theoretical Physics, University of California, Santa Barbara

Apr. 29 - May 24, 2024

ISSP International Research Opportunities for Students Program

Research visit during the KITP program Correlated Gapless Quantum Matter, as an affiliate of Masaki Oshikawa.

SELECTED SCHOOLS AND WORKSHOPS

2024 Prospects in Theoretical Physics 2024: Ultra-Quantum Matter, Institute for Advanced Study, Princeton, July 2024.

PRESENTATIONS

Invited Talk

Feb. 2024 "Finite-size corrections in the presence of boundaries." Seminar on Theoretical Physics in Japan, co-organized with Chongqing University, online.

Contributed Talk

Sep. 2024 "Finite-size corrections to the energy spectra of gapless one-dimensional systems in the presence of boundaries." 79th Annual Meeting of the Physical Society of Japan, Sapporo, Japan.

Selected Poster Presentations

Jun. 2026 "Extracting Boundary Conformal Data from Non-Hermitian Critical Chains." de Sitter Holography Meets Non-Hermitian Quantum Matter, RIKEN, Japan.

Jun. 2026 "Boundary critical phenomena in the quantum Ashkin-Teller model." Emergent Phenomena in Quantum Matter: From Symmetry to Dynamics, YITP, Kyoto, Japan.

Jul. 2024 "Finite-size corrections to the energy spectra of gapless one-dimensional systems in the presence of boundaries." Prospects in Theoretical Physics 2024: Ultra-Quantum Matter, Institute for Advanced Study, Princeton, NJ.

FELLOWSHIPS AND AWARDS

Global Science Graduate Course (GSGC), The University of Tokyo

Oct. 2022 - present

Five-year, scholarship-supported M.Sc.-Ph.D. program

Secondary supervisor: Masahito Yamazaki.

Best Poster Design Award, ISSP Student Presentation Competition

Mar. 2026

Institute for Solid State Physics, The University of Tokyo

ACADEMIC SERVICE

Co-organizer, 2026 Japan Theoretical Physics Scholars Workshop

Mar. 2026

Institute for Solid State Physics, The University of Tokyo

Theory workshop spanning theoretical condensed-matter physics, quantum matter, and related areas.