Tao-Lin Tan

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Work Experience

2020/07 – 2021/07 **Data Scientist,** Phison Electronics Corporation

2019/07 – 2020/06 **Junior Data Engineer,** Commerce Connector GmbH, Asia Limited

2016/02 – 2016/06 **Teaching Assistant of Classical Mechanics,** Department of Electrophysics, National Chiao Tung University

Education

2021/07 – present **PhD, Department of Physics, National Tsing Hua University, Taiwan**
Advisor: *Prof. Yi-Ping Huang*

2015 – 2018 **M.Sc., Institute of Physics, National Chiao Tung University, Taiwan**
Thesis title: *Tensor Network Study of the (1+1)-dimensional Thirring Model.*
Advisor: *Prof. C.-J. David Lin*

2011 – 2015 **B.Sc., Department of Physics, National Chung Hsing University, Taiwan**
Independent study: *Monte Carlo simulation to 2D Ising model with Metropolis sampling.*
Advisor: *Prof. Ming-Chiang Chung*

Skills

Languages — Strong reading, writing, and speaking competencies in English. Currently learning Japanese N3. Learned German A2. Mandarin and Taiwanese are my mother tongues.

Programming — C++, JavaScript, LaTeX, Python, shell script, SQL, …

DevOps — AWS, CI/CD, Docker, unit test, MLFlow

Frontend/Backend — React; Databases, Data Lakes, ETL, serverless, spark, Unix/Linux, web crawling

Numerical Methods — Exact Diagonalization, Tensor Network, Distributed Computing, Anomaly Detection, Clustering, Monte Carlo, XGBoost, Bayesian Optimization, …

Publications

Journal Articles

[1] 1 **T.-L. Tan** and Y.-P. Huang, "Interference-caged quantum many-body scars: the fock space topological localization and interference zeros", (2025, in preparation).

° 2 M. Bañuls, K. Cichy, Y.-J. Kao, C.-J. D. Lin, Y.-P. Lin, and **T.-L. Tan**, "Phase structure of the (1 + 1)-dimensional massive thirring model from matrix product states", Physical Review D **100**, 10.1103/PhysRevD.100.094504 (2019).

Conference Proceedings

° 1 M. Banuls, K. Cichy, H.-T. Hung, Y.-J. Kao, C.-J. D. Lin, Y.-P. Lin, and **T.-L. Tan**, "Phase structure and real-time dynamics of the massive thirring model in 1+1 dimensions using the tensor-network method", in (Jan. 2020), p. 022.

° 2 M.-C. Banuls, K. Cichy, Y.-J. Kao, C.-J. D. Lin, Y.-P. Lin, and **T.-L. Tan**, "Investigation of the 1+1 dimensional thirring model using the method of matrix product states", in (May 2019), p. 229.

° 3 M.-C. Bañuls, K. Cichy, Y.-J. Kao, C.-J. D. Lin, Y.-P. Lin, and **T.-L. Tan**, "Tensor network study of the (1+1)-dimensional thirring model", in , Vol. 175 (Oct. 2017).

Projects

- qlinks: Exact diagonalization toolkit, Fock space graph visualization, and graph automorphism for the study of quantum many-body scars in various lattice models (Python, Jupyter notebook).
- tnpy: A Python implementation of Matrix Product State algorithms, e.g. DMRG and TEBD (Python).
- mbl: Exact diagonalization and Tree Strong-Disorder Renormalization Group (TSDRG) toolkit for studying many-body localization (Python).
- HybridLeads: Study the conductivity of an impurity model sandwiched by two leads (C++).
- HOTRG-2D-Ising: Higher-order Tensor Renormalization Group study to 2D classical Ising model (Jupyter notebook).
- anko: A Python implementation of anomaly detection algorithms on time series (Python).
- EAN-suggestion: Calculate the Levenshtein distance between the name of the web-crawled product and databases for suggesting EAN of the product (Python).
- binpr: Pattern recognition on the failed bins in silicon wafer based on OPTICS algorithm (Python).

Miscellaneous Experience

Awards and Achievements

Fall 2021 - present — **President's Scholarship**, National Tsing Hua University.

Presentations

Jan 15 2025 — **2025 Annual Meeting of the Physical Society of Taiwan, NSYSU**.
Title: *Interference-caged quantum many-body scars: the Fock space topological localization and interference zeros.*

Jan 13 2025 — **2025 Pre TPS miniworkshop, NTHU**.
Title: *Interference-caged quantum many-body scars: the Fock space topological localization and interference zeros.*

Sep 25 2024 — **Current and Future Computational Approaches to Quantum Many-Body Systems 2024, ISSP, Kashiwa Campus, University of Tokyo**.
Title: *Quantum many-body scars as caged eigenstates via destructive interference in Hilbert space.*

May 21 2024 — **NYCU HEP Seminar, NYCU**.
Title: *Quantum many-body scars as caged eigenstates via destructive interference in Hilbert space.*

Miscellaneous Experience (continued)

Mar 27 2024 — **SQAI-NCTS Workshop on Tensor Network and Quantum Embedding, University of Tokyo**.
Title: *Quantum many-body scars and their dynamics in the $U(1)$ lattice gauge theory.*

Jan 26 2024 — **2024 Annual Meeting of the Physical Society of Taiwan, NCU**.
Title: *Quantum many-body scars and their dynamics in the $U(1)$ lattice gauge theory.*

Jan 26 2018 — **2018 Annual Meeting of the Physical Society of Taiwan, NTU**.
Title: *Tensor Network Study of the (1+1)-dimensional Thirring Model.*

June 23 2017 — **35th International Symposium On Lattice Field Theory, Granada**.
Title: *Tensor Network study of the (1+1)-dimensional Thirring Model.*

May 17 2017 — **The 12th particle physics phenomenology (ppp12) workshop, NCTU**.
Title: *Tensor Network study of the (1+1)-dimensional Thirring Model.*

Research Visiting

July 2017 — **DAMTP, Cambridge University**.
Invited by: *Prof. Matthew Wingate*

Apr 2016 — **Department of Physics, Goethe University Frankfurt**.
Invited by: *Dr. Krzysztof Cichy*

Business Trip

Dec 2019 — **Annual meeting at Commerce Connector GmbH headquarters, Stuttgart**.

Journal Clubs

Fall 2024 — **Quantum Information Theory and Quantum Games, NTHU**

Spring 2018 — **Conjugate Gradient Descent, NCTU**

Fall 2016 — **Lattice Quantum Chromodynamics, NTHU**

Fall 2015 — **Tensor Network Methods, NCTU**

Spring 2014 — **Topological Insulators and Topological Superconductors, NCHU**

Poster

Sep 25 2024 — **Current and Future Computational Approaches to Quantum Many-Body Systems 2024, ISSP, Kashiwa Campus, University of Tokyo**.
Title: *Quantum many-body scars as caged eigenstates via destructive interference in Hilbert space.*

Mar 27 2024 — **SQAI-NCTS Workshop on Tensor Network and Quantum Embedding, University of Tokyo**.
Title: *Quantum many-body scars and their dynamics in the $U(1)$ lattice gauge theory.*

Dec 12 2016 — **The fourth workshop on Tensor Network States: Algorithms and Applications, NTHU**.
Title: *Tensor network study to (1+1)-dimensional field theory: The quantum soliton states in sine-Gordon theory*

Certification

2022 — **TOEIC, total score 885.**