Yupan Liu

Curriculum Vitae

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Research Interests

My research interests lie in theoretical computer science, with a focus on quantum complexity theory and quantum algorithms. My work centers on two main themes:

- **The interplay between quantum property testing and complexity theory**, including various settings of quantum state testing (both computational hardness and algorithmic aspects), the computational power of the classes QSZK and BQL, and the design of new quantum algorithms that are efficient in terms of time or space.
- **Quantum computation with limited resources, especially the role of randomness**. Specifically, the impact of intermediate measurements in different contexts related to quantum logspace (e.g., space-bounded quantum interactive proofs), and the computational power of the class StoqMA, with connections to derandomization and PCP.

Education & Employment

2025.10–	**Postdoctoral Researcher**, *École Polytechnique Fédérale de Lausanne (EPFL)*, Lausanne, Switzerland. Supervisor: Thoams Vidick
2025.04– 2025.09	**Designated Assitant Professor (Postdoc)**, *Nagoya University*, Nagoya, Japan. Supervisor: François Le Gall
2022.10– 2025.03	**Ph.D. in Mathematics**, *Nagoya University*, Nagoya, Japan. Advisor: François Le Gall Ph.D. Thesis: *Complexity-theoretic perspectives on quantum state testing*
2020.07– 2020.12	**Ph.D. in Computer Science (Discontinued)**, *Hebrew University*, Jerusalem, Israel. Advisor: Dorit Aharonov
2017.10– 2020.03	**M.Sc. in Computer Science**, *Hebrew University*, Jerusalem, Israel. Advisors: Dorit Aharonov and Itai Arad (Technion) Overall GPA: 93.22 M.Sc. Thesis: *Towards a quantum-inspired proof for* IP = PSPACE
2013.09– 2017.07	**B.Eng. in Computer Science and Technology**, *Zhejiang University*, Hangzhou, China. Overall GPA: 85.28, Major (last-two-year) GPA: 88.22 Senior Project Advisor: Xin Wan (Department of Physics)

Academic Visits & Internships

2022.04- 2022.08	**(Remote) Visiting Student**, *Graduate School of Mathematics*, Nagoya University, Nagoya, Japan. Advisor: François Le Gall
2021.03- 2021.08	**(Remote) Visiting Student**, *Centre for Quantum Software and Information*, University of Technology Sydney, Sydney, Australia. Advisor: Zhengfeng Ji

Summer 2019   **Research Internship**, *Centre for Quantum Technologies*, National University of Singapore.
Advisors: Itai Arad (Technion) and Miklos Santha

Summer 2016   **Research Internship**, *Centre for Quantum Technologies*, National University of Singapore.
Advisors: Itai Arad and Miklos Santha

Publications & Preprints

(Authors of papers in theoretical computer science are listed *alphabetically*.)
■ Conference Proceedings   ■ Conference without Proceedings   ■ Journal

◇ On estimating the quantum ℓ_α distance
Yupan Liu and Qisheng Wang
ESA 2025. **AQIS 2025** (long talk). arXiv:2505.00457

◇ Space-bounded quantum interactive proof systems
François Le Gall, **Yupan Liu**, Harumichi Nishimura, and Qisheng Wang
CCC 2025. **QIP 2025**. arXiv:2410.23958

◇ On estimating the trace of quantum state powers
Yupan Liu and Qisheng Wang
SODA 2025. **QIP 2025**. arXiv:2410.13559

◇ Space-bounded quantum state testing via space-efficient quantum singular value transformation
François Le Gall, **Yupan Liu**, and Qisheng Wang
In submission. arXiv:2308.05079

◇ Quantum state testing beyond the polarizing regime and quantum triangular discrimination
Yupan Liu
computational complexity. arXiv:2303.01952

◇ Quantum Merlin-Arthur proof systems for synthesizing quantum states
Hugo Delavenne, François Le Gall, **Yupan Liu**, and Masayuki Miyamoto
Quantum (2025). arXiv:2303.01877

◇ StoqMA meets distribution testing
Yupan Liu
TQC 2021. arXiv:2011.05733

◇ StoqMA vs. MA: the power of error reduction
Dorit Aharonov, Alex B. Grilo, and **Yupan Liu**
Quantum (2025). arXiv:2010.02835

◇ Towards a quantum-inspired proof for IP = PSPACE
Ayal Green, Guy Kindler, and **Yupan Liu**
Quantum Information & Computation (2021). arXiv:1912.11611

Seminar & Conference Talks

■ Conference Proceedings   ■ Conference without Proceedings   ■ Workshop

◇ **On estimating the quantum ℓ_α distance**
CS Seminar, Centre for Quantum Technologies, Singapore (Online). July 16th, 2025
LA Symposium 2025 in Summer. July 23rd, 2025
ESA 2025. Sept. 16th, 2025

- ◇ **Space-bounded quantum interactive proof systems**
  IQC Math & CS Seminar, University of Waterloo. Aug. 1st, 2025
  CS Theory Seminar, Penn State University. Jan. 22nd, 2025
  CS Theory Student Seminar, Columbia University. Oct. 16th, 2024
  CCC 2025. Aug. 8th, 2025
  QIP 2025. Feb. 25th, 2025

- ◇ **On estimating the trace of quantum state powers**
  School of Engineering and Applied Sciences, Harvard University. Oct. 10th, 2024
  Department of Mathematics, Ohio State University (Online). Oct. 8th, 2024
  SODA 2025. Jan 12th, 2025

- ◇ **Space-bounded quantum state testing via space-efficient quantum singular value transformation**
  Quantum Information Theory Seminar, University of Bristol. Mar. 6th, 2024
  Algorithm and Complexity Seminar, University of Cambridge. Feb. 26th, 2024
  CS Seminar, Centre for Quantum Technologies, Singapore (Online). Nov. 20th, 2023
  QuSoft Seminar (Online). Sept. 22nd, 2023
  Research Center for Quantum Software, Tsinghua University. Aug. 9th, 2023
  Shenzhen-Nagoya Workshop on Quantum Science 2024. Sept. 19th, 2024

- ◇ **Quantum state testing beyond the polarizing regime and quantum triangular discrimination**
  LA Symposium 2023 in Summer. July 4th, 2023

- ◇ StoqMA **meets distribution testing**
  Department of Computer Science and Technology, Nanjing University. Dec. 9th, 2020
  AMSS-UTS Joint Workshop on Quantum Computing (Online). Dec. 16th, 2020
  TQC 2021. July 7th, 2021

- ◇ **The untold story of** StoqMA
  University College London (Online). Dec. 3rd, 2020
  Yukawa Institute for Theoretical Physics, Kyoto University (Online). Nov. 30th, 2020

- ◇ **Towards a quantum-inspired proof for** IP = PSPACE
  NTT Basic Research Laboratories. Oct. 18th, 2019
  Yukawa Institute for Theoretical Physics, Kyoto University. Oct. 15th, 2019

- ◇ **An Invitation to Stoquastic Hamiltonian Complexity**
  University of Science and Technology of China. Oct. 8th, 2019

Professional Services

Reviewer FOCS (2025, 2024, 2023, 2020), STOC (2025, 2024, 2023), CCC (2024), SODA (2025, 2024, 2022), ITCS (2026, 2024), ICALP (2024×2), ESA (2024), COLT (2025); QIP (2025×4, 2024×3, 2023, 2022×2, 2021), TQC (2025×2, 2024, 2022, 2020×2), AQIS (2023); SIAM Journal on Computing, Nature Physics, Theory of Computing Systems, Quantum.

Academic Honors & Awards

Nagoya University Interdisciplinary Frontier Fellowship, *Nagoya University*.
2023.04 - 2025.03

Teaching Experience

Fall 2019 **Kazhdan's Lecture: Computation, quantumness, symplectic geometry, information**,
Hebrew University, Jerusalem, Israel.
Instructors: Gil Kalai, Leonid Polterovich, Dorit Aharonov, Guy Kindler
Scribed notes for all computer science oriented lectures (half of the course).