

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

### Academic Visits & Internships

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

- ◊ Computational hardness of estimating quantum entropies via binary entropy bounds  
**Yupan Liu**  
arXiv:2500.00000
- ◊ A slightly improved upper bound for quantum statistical zero-knowledge  
François Le Gall, **Yupan Liu**, and Qisheng Wang  
arXiv:2500.00000
- ◊ On estimating the quantum  $\ell_\alpha$  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  
To appear in **computational complexity**. arXiv:2308.05079
- ◊ Quantum state testing beyond the polarizing regime and quantum triangular discrimination  
**Yupan Liu**  
**computational complexity (2025)**. 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  $\ell_\alpha$  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

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## Professional Services

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

## 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).