Yupan Liu

Curriculum Vitae

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Education

2022.10–2025.03 (Expected) **Ph.D. in Mathematics**, *Nagoya University*, Nagoya, Japan.
Advisor: François Le Gall

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

Research Interests

My research interests lie in theoretical computer science, with a particular focus on quantum computing and complexity theory, such as (some of) problems that I used to work on: understanding the randomness arising from the quantumness (StoqMA vs. MA); complexity and algorithms on space-bounded quantum computation. I am also broadly interested in theoretical computer science in general.

Research Experience

2022.10- **Research Student**, *Graduate School of Mathematics*, Nagoya University, Nagoya, Japan.
Advisor: François Le Gall

2022.04-2022.08 **(Remote) Visiting Student**, *Graduate School of Mathematics*, Nagoya University, Nagoya, Japan.
Advisor: François Le Gall

2017-2020 **Research Student**, *CS Theory Group*, Hebrew University, Jerusalem, Israel.
Advisors: Dorit Aharonov and Itai Arad (Technion)

2018-2019 **Research Student**, *CS Theory Group*, Hebrew University, Jerusalem, Israel.
Advisor: Guy Kindler

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

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

2016–2017 **Research Student**, *Department of Physics*, Zhejiang University, Hangzhou, China.
Advisor: Xin Wan

Publications

(The authors of papers in theoretical computer science are listed alphabetically.)

(Detailed abstracts can be found on my website.)

- ◇ François Le Gall, Yupan Liu, Harumichi Nishimura, and Qisheng Wang. Space-bounded quantum interactive proof systems. *In submission*. 2024.
- ◇ Yupan Liu and Qisheng Wang. On estimating the trace of quantum state powers. To appear in *SODA 2025*. 2024.
- ◇ François Le Gall, Yupan Liu, and Qisheng Wang. Space-bounded quantum state testing via space-efficient quantum singular value transformation. *In submission*. Also available at arXiv: 2308.05079, 2023.
- ◇ Yupan Liu. Quantum state testing beyond the polarizing regime and quantum triangular discrimination. *In submission*. Also available at arXiv: 2303.01952, 2023.
- ◇ Hugo Delavenne, François Le Gall, Yupan Liu, and Masayuki Miyamoto. Quantum Merlin-Arthur proof systems for synthesizing quantum states. To appear in *Quantum*. Also available at arXiv: 2303.01877, 2023.
- ◇ Yupan Liu. StoqMA meets distribution testing. *In Proceedings of 16th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2021)*, LIPIcs volume 197, pp.4:1-4:22, 2021. Also available at arXiv: 2011.05733, 2020.
- ◇ Dorit Aharonov, Alex B. Grilo, and Yupan Liu. StoqMA vs. MA: the power of error reduction. To appear in *Quantum*. Also available at arXiv: 2010.02835, 2020.
- ◇ Ayal Green, Guy Kindler, and Yupan Liu. Towards a quantum-inspired proof for IP = PSPACE. *Quantum Information & Computation*, 21(5-6):0377-0386, 2021. Also available at arXiv: 1912.11611, 2019.

Invited Talks

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

- ◇ *Quantum state testing beyond the polarizing regime and quantum triangular discrimination*. Regular talk, LA Symposium 2023 in Summer, Jul. 4th, 2023.
- ◇ StoqMA *meets distribution testing*. Contributed talk, 16th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2021), Jul. 7th, 2021.
- ◇ StoqMA *meets distribution testing*. Invited talk at AMSS-UTS Joint Workshop on Quantum Computing (Online), Dec. 16th, 2020.
- ◇ StoqMA *meets distribution testing*. Invited talk at Nanjing University, Dec. 9th, 2020.
- ◇ *The untold story of* StoqMA. Invited talk at University College London (Online), Dec. 3rd, 2020.
- ◇ *The untold story of* StoqMA. Invited talk at Kyoto University (Online), Nov. 30th, 2020.
- ◇ *Towards a quantum-inspired proof for* IP = PSPACE. Invited talk at NTT Basic Research Laboratories, Oct. 18th, 2019.
- ◇ *Towards a quantum-inspired proof for* IP = PSPACE. Invited talk at Kyoto University, Oct. 15th, 2019.
- ◇ *An Invitation to Stoquastic Hamiltonian Complexity*. Invited talk at University of Science and Technology of China, Oct. 8th, 2019.

Professional Services

Reviewer FOCS (2024, 2023, 2020), STOC (2024, 2023), CCC (2024), SODA (2025, 2024, 2022), ITCS (2024), ICALP (2024×2), ESA (2024); QIP (2024×3, 2023, 2022×2, 2021), TQC (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).