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*

2020.12– 2022.09 **Self-funded Researcher**, Shenzhen, China.
Includes remote visits with Zhengfeng Ji (2021) and François Le Gall (2022); see "Academic Visits".

2020.07– 2020.11 **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
Final-Year 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

- Computational hardness of estimating quantum entropies via binary entropy bounds
  Yupan Liu
  To appear in **STACS 2026**. arXiv:2601.03734
- A slightly improved upper bound for quantum statistical zero-knowledge
  François Le Gall, **Yupan Liu**, and Qisheng Wang
  arXiv:2512.11597
- 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
  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

- ◇ **Computational hardness of estimating quantum entropies via binary entropy bounds**
  Zhejiang Insitute of Modern Physics, Zhejiang University, 2025-12-26
  School of Intelligent Software and Engineering, Nanjing University, 2025-12-25
- ◇ **On estimating the quantum ℓ_α distance**
  CS Seminar, Centre for Quantum Technologies, Singapore (Online), 2025-07-16
  LA Symposium 2025 in Summer, 2025-07-23
  ESA 2025, 2025-09-16
- ◇ **Space-bounded quantum interactive proof systems**
  IQC Math & CS Seminar, University of Waterloo, 2025-08-01
  CS Theory Seminar, Penn State University, 2025-01-22
  CS Theory Student Seminar, Columbia University, 2024-10-16
  CCC 2025, 2025-08-08
  QIP 2025, 2025-02-25
- ◇ **On estimating the trace of quantum state powers**
  School of Engineering and Applied Sciences, Harvard University, 2024-10-10
  Department of Mathematics, Ohio State University (Online), 2024-10-08
  SODA 2025, 2025-01-12
- ◇ **Space-bounded quantum state testing via space-efficient quantum singular value transformation**
  Quantum Information Theory Seminar, University of Bristol, 2024-03-06
  Algorithm and Complexity Seminar, University of Cambridge, 2024-02-26
  CS Seminar, Centre for Quantum Technologies, Singapore (Online), 2023-11-20
  QuSoft Seminar (Online), 2023-09-22
  Research Center for Quantum Software, Tsinghua University, 2023-08-09
  Shenzhen-Nagoya Workshop on Quantum Science 2024, 2024-09-19
- ◇ **Quantum state testing beyond the polarizing regime and quantum triangular discrimination**
  LA Symposium 2023 in Summer, 2023-07-04
- ◇ StoqMA **meets distribution testing**
  Department of Computer Science and Technology, Nanjing University, 2020-12-09
  AMSS-UTS Joint Workshop on Quantum Computing (Online), 2020-12-16
  TQC 2021, 2021-07-07
- ◇ **The untold story of** StoqMA
  University College London (Online), 2020-12-03
  Yukawa Institute for Theoretical Physics, Kyoto University (Online), 2020-11-30
- ◇ **Towards a quantum-inspired proof for** IP = PSPACE
  NTT Basic Research Laboratories, 2019-10-18
  Yukawa Institute for Theoretical Physics, Kyoto University, 2019-10-15

Professional Services

Conference 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).

Journal Reviewer: SIAM Journal on Computing×2, Nature Physics, Theory of Computing Systems, Quantum×2, ACM Transactions on Quantum Computing.

Service: Admissions prefiltering for the EPFL EDIC PhD program (December 2025).

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).