Honghao Fu

Assistant Professor

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🕮 *Google scholar profile*

Research Interests

◇ **Quantum computing**: Computations on near-term Noisy Intermediate-Scale Quantum (NISQ) devices and quantum advantages of such devices.

◇ **Quantum cryptography**: Benchmarking of untrusted quantum devices using nonlocality and cryptography.

Employment

2024–	**Assistant Professor, Concordia University**, Montreal, QC, Canada
	Concordia Institute for Information Systems Engineering
2021-2024	**Postoctoral Associate, MIT**, Cambridge, MA, USA
	Computer Science and Artificial Intelligence Laboratory, EECS
	PI: Anand Natarajan

Education

2016 – 2021	**Ph.D., University of Maryland**, College Park, MD, USA.
	Joint Center for Quantum Information and Computer Science.
	Thesis: *The membership problem for quantum constant-sized correlations is undecidable.*
	Advisor: Carl A. Miller
2014 – 2016	**Master of Mathematics, University of Waterloo**, Waterloo, ON, CA.
	Institute for Quantum Computing.
	Thesis: *Quantum state purification.*
	Advisors: Andrew Childs and Debbie Leung
2009 – 2014	**Bachelor of Computer Science, University of Waterloo**, Waterloo, ON, CA.
	With Distinction on Dean's Honours List
	Department of Computer Science.

Publications

Publication in Refereed Conference

2024 **The computational advantage of MIP^* vanishes in the presence of noise**

Authors: Yangjing Dong, Honghao Fu, Anand Natarajan, Minglong Qin, Haochen Xu and Penghui Yao

Accepted by the 2024 Computational Complexity Conference (**CCC**), July 2024.

2023 **Parallel self-testing of EPR pairs under computational assumptions**

Authors: Honghao Fu, Daochen Wang and Qi Zhao

In the 50th International Colloquium on Automata, Languages, and Programming (**ICALP**), July 2023.

Publications in Refereed Journals

2022 **Constant-sized correlations are sufficient to robustly self-test maximally entangled states of unbounded dimension**

Author: Honghao Fu

Quantum, Volume 6, 614, 2022.

Contributed talk at the 23rd Annual Conference on Quantum Information Processing (**QIP**), January 2020.

2021 **Device-independent randomness expansion with entangled photons**

Authors: Lynden K. Shalm, Yanbao Zhang, Joshua C. Bienfang, Collin Schlager, Martin J. Stevens, Michael D. Mazurek, Carlos Abellán, Waldimar Amaya, Morgan W. Mitchell, Mohammad A. Alhejji, Honghao Fu, Joel Ornstein, Richard P. Mirin, Sae Woo Nam and Emanuel Knill

Nature Physics, Volume 17, 452-456, 2021.

2020 **Efficient randomness certification by quantum probability estimation**

Authors: Yanbao Zhang, Honghao Fu and Emanuel Knill

Physical Review Research, Volume 2, 013016, 2020.

2020 **Experimental low-latency device-independent quantum randomness**

Authors: Yanbao Zhang, Lynden K. Shalm, Joshua C. Bienfang, Martin J. Stevens, Michael D. Mazurek, Sae Woo Nam, Carlos Abellán, Waldimar Amaya, Morgan W. Mitchell, Honghao Fu, Carl A. Miller, Alan Mink, and Emanuel Knill

Physical Review Letters, Volume 124, 010505, 2020.

2018 **Local randomness: examples and application**

Authors: Honghao Fu and Carl A. Miller

Physical Review A, Volume 97, 032324 , 2018.

Contributed talk at the 7th Annual Conference on Quantum Cryptography (**QCrypt**), September 2017.

2014 **When the asymptotic limit offers no advantage in the local-operations-and-classical-communication paradigm**

Authors: Honghao Fu, Laura Mančinska and Debbie Leung

Physical Review A, Volume 89, 052310, 2014.

Manuscripts and Preprints

2023 **A cryptographic perspective on the verifiability of quantum advantage**

Authors: Nai-Hui Chia, Honghao Fu, Fang Song and Penghui Yao

arXiv quant-ph arXiv:2310.14464, October 2023.

2023 **Streaming quantum state purification**

Authors: Andrew Childs, Honghao Fu, Debbie Leung, Zhi Li, Maris Ozols and Vedang Vyas

arXiv quant-ph arXiv:2309.16387, September 2023.

2021 **The membership problem for constant-sized quantum correlations is undecidable**

Authors: Honghao Fu, Carl A. Miller and William Slofstra

arXiv quant-ph arXiv:2101.11087, January 2021.

Contributed talk at the 24rd Annual Conference on Quantum Information Processing (**QIP**), February 2021.

Submitted to Communication in Mathematical Physics.

Selected Talks

2023 **Parallel self-testing of EPR pairs under computational assumptions**

ICALP 2023, Paderborn, Germany, July 2023.

2021 **The membership problem for constant-sized quantum correlations is undecidable**

QIP 2021, Munich, Germany, February 2021.

2020 **Constant-sized correlations are sufficient to self-test maximally entangled states of unbounded dimension**

QIP 2020, Shenzhen, China, January 2020.

2017 **Randomness in nonlocal games between mistrustful players**

QCrypt 2017, Cambridge, UK, September 2017.

Invited Talks

2022 **Quantum self-tests in the nonlocal and computational settings**

Invited Zoom talk at Institute of Computing Technology, Chinese Academy of Science, November 2022.

2022 **The membership problem for constant-sized quantum correlations is undecidable**

Invited Zoom talk at the NTT-MIT group meeting, June 2022.

2019 **Constant-sized correlations are sufficient to self-test maximally entangled states of unbounded dimension**

Invited talk at CQIQC, University of Toronto, Toronto, Canada, December 2019.

Teaching

Teaching Assistant

Spring 2017	CMSC 351: Algorithms, University of Maryland, College Park.
Fall 2016	CMSC 351: Algorithms, University of Maryland, College Park.
Spring 2016	CS 136: Elementary Algorithm Design and Data Abstraction, University of Waterloo.
Fall 2015	CS 136: Elementary Algorithm Design and Data Abstraction, University of Waterloo.
Spring 2015	CS 341: Algorithms, University of Waterloo.
Fall 2014	CS 341: Algorithms, University of Waterloo.

Internships

2013/05 – **Software Engineer, Facebook Inc.**, Menlo Park, CA, USA.
2013/08 News Feed Backend Team

2012/09 – **Software Developer, Amazon.com, Inc.**, Seattle, WA, USA.
2012/12 AWS Backend Team

2012/01 – **Software Developer, Desire2Learn, Inc.**, Kitchenr, ON, CA.
2012/04 Mobile Team

2011/05 – **Software Developer, Sybase Cananda Ltd.**, Waterloo, ON, CA.
2011/08 Internal Tools Team

Professional Services

Reviewer

Conference	QIP, TQC, QCrypt, FOCS. ICALP, STACS
Journal	PRL, PRA, IEEE Transaction on Information Theory, Quantum, Quantum Information Processing,npj Quantum Information, Communications Physics.

Honors and Awards

2016-2018 **Dean's Fellowship**, University of Maryland, College Park.

2015-2016	**NSERC Alexander Graham Bell Canada Graduate Scholarship - Masters**, University of Waterloo.
2014-2016	**President's Graduate Scholarship**, University of Waterloo.
2014-2015	**Ontario Graduate Scholarship**, University of Waterloo.
09/2009	**University of Waterloo President's Scholarship for excellent performance in high school**, University of Waterloo.
09/2009	**Rene Descartes Scholarship of Math Faculty**, University of Waterloo.
09/2009	**Mathematics International Students Entrance Scholarship**, University of Waterloo.

References

Anand Natarajan, Faculty, Massachusetts Institute of Technology.
Email: anandn@mit.edu

Carl A. Miller, Faculty, University of Maryland, College Park.
Email: camiller@umd.edu

William Slofstra, Faculty, University of Waterloo.
Email: william.slofstra@uwaterloo.ca