

# Shilin Huang

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## PROFESSIONAL PREPARATION

Tsinghua University	Computer Science and Technology	BEng 2018
Duke University	Electrical and Computer Engineering	PhD 2023
Yale University	Applied Physics	Postdoc 2023-2024
<i>Graduate Thesis Advisor</i>	Prof. Kenneth R. Brown	
<i>Postdoc Advisor</i>	Prof. Shruti Puri	

## APPOINTMENT

Assistant Professor	Department of Physics, The Hong Kong University of Science and Technology	08/2024-Present
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## RESEARCH INTERESTS

Theory of quantum information processing: quantum error correction, quantum control

## PUBLICATIONS (\*: selected publications)

### *Preprints*

- (1) Error correction of transversal controlled-NOT gates for scalable surface code computation  
K. Sahay, Y. Lin, **S. Huang**, K. R. Brown and S. Puri  
arXiv:2408.01393 (2024)
- (2) Fault tolerance of stabilizer channels  
M. Beverland, **S. Huang** and V. Kliuchnikov  
arXiv:2401.12017 (2024)
- (3)\* Comparing Shor and Steane error correction using the Bacon-Shor code  
**S. Huang**, K. R. Brown and M. Cetina  
arXiv:2312.10851 (2023)

### *Peer-reviewed journal articles*

- (4)\* Increasing memory lifetime of quantum low-density parity check codes with sliding-window noisy syndrome decoding  
**S. Huang** and S. Puri  
Phys. Rev. A 110 (1), 012453 (2024)
- (5) Single-shot error correction on toric codes with high-weight stabilizers

- Y. Lin, **S. Huang** and K. R. Brown  
Phys. Rev. A 109 (5), 052438 (2024)
- (6) Optimization tools for distance-preserving flag fault-tolerant error correction  
B. Pato, T. Tansuwannont, **S. Huang** and K. R. Brown  
PRX Quantum 5 (2), 020336 (2024)
- (7)\* Homomorphic logical measurements  
**S. Huang**, T. Jochym-O'Connor and T. J. Yoder  
PRX Quantum 4 (3), 030301 (2023)
- (8) Angle-robust two-qubit gates in a linear ion crystal  
Z. Jia, **S. Huang**, M. Kang, K. Sun, R. F. Spivey, J. Kim and K. R. Brown  
Phys. Rev. A 107 (3), 032617 (2023)
- (9) Crosstalk suppression and individually addressed two-qubit gates in a trapped-ion quantum computer  
C. Fang, Y. Wang, **S. Huang**, K. R. Brown and J. Kim  
Phys. Rev. Lett. 129 (24), 240504 (2022)
- (10)\* Between Shor and Steane: A unifying construction for measuring error syndromes  
**S. Huang** and K. R. Brown  
Phys. Rev. Lett. 127 (9), 090505 (2021)
- (11) Constructions for measuring error syndromes in Calderbank-Shor-Steane codes between Shor and Steane methods  
**S. Huang** and K. R. Brown  
Phys. Rev. A 104 (2), 022429 (2021)
- (12) Batch optimization of frequency-modulated pulse for robust two-qubit gates in ion chains  
M. Kang, Q. Liang, B. Zhang, **S. Huang**, Y. Wang, C. Fang, J. Kim and K. R. Brown  
Phys. Rev. Appl. 16 (2), 024039 (2021)
- (13) High-fidelity two-qubit gates using a microelectromechanical-system-based beam steering system for individual qubit addressing  
Y. Wang, S. Crain, C. Fang, B. Zhang, **S. Huang**, Q. Liang, P. H. Leung, K. R. Brown, J. Kim  
Phys. Rev. Lett. 125 (15), 150505 (2020)
- (14) Logical performance of 9 qubit compass codes in ion traps with crosstalk errors  
D. M. Debroy, M. Li, **S. Huang** and K. R. Brown  
Quantum Sci. Technol. 5 (3), 034002 (2020)
- (15)\* Fault-tolerant weighted union-find decoding on the toric code  
**S. Huang**, M. Newman and K. R. Brown  
Phys. Rev. A 102 (1), 012419 (2020)
- (16) Fault-tolerant compass codes  
**S. Huang** and K. R. Brown

Phys. Rev. A 101 (4), 042312 (2020)

- (17) Symmetric versus bosonic extension for bipartite states  
Y. Li, **S. Huang**, D. Ruan and B. Zeng  
Phys. Rev. A 99 (1), 012332 (2019)
- (18) Quantum state tomography for generic pure states  
**S. Huang**, J. Chen, Y. Li and B. Zeng  
Sci. China Phys. Mech. 61, 1-7 (2018)
- (19) Separability-entanglement classifier via machine learning  
S. Lu, **S. Huang**, K. Li, J. Li, J. Chen, D. Lu, Z. Ji, Y. Shen, D. Zhou and B. Zeng  
Phys. Rev. A 98 (1), 012315 (2018)
- (20) NMRCloudQ: a quantum cloud experience on a nuclear magnetic resonance quantum computer  
T. Xin, **S. Huang**, S. Lu, K. Li, Z. Luo, Z. Yin, J. Li, D. Lu, G. Long and B. Zeng  
Sci. Bull., 63 (1), 17-23 (2018)
- (21) Discrete gravity on random tensor network and holographic Rényi entropy  
M. Han and **S. Huang**  
JHEP 2017 (11), 1-25 (2017)
- (22) Optimal design of measurement settings for quantum-state-tomography measurements  
J. Li, **S. Huang**, Z. Luo, K. Li, D. Lu and B. Zeng  
Phys. Rev. A 96 (3), 032307 (2017)

### *Conference Proceedings*

- (23) Quantum fan-out: Circuit optimizations and technology modeling  
P. Gokhale, S. Koretsky, **S. Huang**, S. Majumder, A. Drucker, K. R. Brown and F. T. Chong 2021 IEEE International Conference on Quantum Computing and Engineering (QCE), pp. 276-290 (2021)

### **PATENTS**

- (1) Crosstalk suppression with local controls  
**S. Huang**, Y. Wang and K. R. Brown  
US Patent App. 18/107,942 (2024)
- (2) Discrete frequency modulated gates for conditional logical in trapped ion quantum computers  
K. R. Brown, P. H. Leung, **S. Huang**, B. Zhang  
US Patent App. 17/212,678 (2021)

### **INVITED TALKS**

- (1) IBM Quantum, Qiskit Seminar, Apr 2024
- (2) Massachusetts Institute of Technology, Seminar, Jan 2023
- (3) Yale Quantum Institute, YQI Talk, Nov 2022

## **HONORS AND AWARDS**

Outstanding Undergraduate Thesis Award, Tsinghua University, 2018

Yao Award (Recognition Prize), Tsinghua University, 2017

Gold Medalist, National Olympiad in Informatics, China, 2013

## **SERVICE**

Reviewer for Physical Review X, Physical Review Letters, PRX Quantum, Physical Review A, Nature Physics, NPJ Quantum Information, New Journal of Physics, Quantum, IEEE Transactions on Information Theory