

Kishor Bharti

Curriculum Vitae

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📁 [contextual-stories](#)

Research Interests

Quantum Computation, Quantum Information, Combinatorial Optimization, Quantum Foundations, Artificial Intelligence. [Link to Google Scholar](#)

Education

- 2016–2021 **Ph.D. in Quantum Information**, *Centre for Quantum Technologies*, National University of Singapore, Advisors: [Vlatko Vedral](#) and [Leong-Chuan Kwek](#).
- 2011–2016 **Integrated BS-MS in Physics**, *Indian Institute of Science Education and Research*, Mohali, India.

Experience

- Dec 2021 - Present **Postdoctoral Research Associate**, *Joint Center for Quantum Information and Computer Science and Joint Quantum Institute, NIST/University of Maryland, College Park, Maryland 20742, USA.*
- Aug 2016 - Nov 2021 **Researcher**, *Centre for Quantum Technologies, National University of Singapore, 3 Science Drive 2, Singapore 117543.*
- Jan -April 2020 **Quantum Machine Learning Scientist**, *Entropica Labs, Singapore.*
- May 2019 **Visiting Researcher**, *Centre for Quantum Information and Communication, Belgium.*
- April 2019 **Visiting Researcher**, *Nordic Institute for Theoretical Physics, Stockholm.*
- May-July 2015 **DAAD WISE Summer Intern (Experimental Research)**, *University of Ulm, Germany.*

Professional Services

- Editor: Quantum
- Referee: Nature Physics, PRX Quantum, PRA, Quantum, Quantum Science and Technology, Machine Learning: Science and Technology, npj Quantum Information, Communications Physics, TQC, QIP
- PC: Quantum Techniques in Machine Learning 2021
- Convener Near-term Advantage Journal Club, QuICS (2022-Present)
- Convener Convener, Quantum Machine Learning Journal Club, CQT (2018-21)

Academic Papers (Selected)

- (1) **Noisy Intermediate-Scale Quantum (NISQ) Algorithms**, *K Bharti**, *AC Lierta**, *TH Kyaw**, *T Haug*, *SA Lea*, *A Anand*, *M Degroote*, *H Heimonen*, *JS Kottmann*, *T Menke*, *WK Mok*, *S Sim*, *LC Kwek*, *AA Guzik*, *Rev. Mod. Phys.* **94**, 015004, [Link to CQT news highlight](#).
- (2) **Graph-Theoretic Framework for Self-Testing in Bell Scenarios**, *K Bharti*, *M Ray*, *ZP Xu*, *M Hayashi*, *LC Kwek*, *A Cabello*, [arXiv:2104.13035](#).
- (3) **Capacity and Quantum Geometry of Parameterized Quantum Circuits**, *T Haug*, *K Bharti*, *MS Kim*, *PRX Quantum* **2**, 040309, [Link to CQT news highlight](#).
- (4) **NISQ Algorithm for Semidefinite Programming**, *K Bharti*, *T Haug*, *V Vedral*, *LC Kwek*, [arXiv:2106.03891](#).
- (5) **Near-Term Quantum Algorithms for Linear Systems of Equations**, *HY Huang*, *K Bharti*, *P Rebentrost*, *New Journal of Physics*, Volume 23, November 2021.
- (6) **Robust Self-Testing of Quantum Systems via Noncontextuality Inequalities**, *K Bharti*, *M Ray*, *A Varvitsiotis*, *NA Warsi*, *A Cabello*, *LC Kwek*, *Physical Review Letters* **122** (25), 250403, [Link to CQT news highlight](#).

*: Equal contribution

Academic Papers (Remaining)

- (7) **Quantum Assisted Simulator**, *K Bharti*, *T Haug*, *Phys. Rev. A* **104**, 042418.
- (8) **Fast-Forwarding with NISQ Processors without Feedback Loop**, *KH Lim*, *T Haug*, *LC Kwek*, *K Bharti*, *Quantum Science and Technology*, Volume 7, Number 1.
- (9) **NISQ Algorithm for Hamiltonian Simulation via Truncated Taylor Series**, *JW Zhong Lau*, *T Haug*, *LC Kwek*, *K Bharti*, *SciPost Phys.* **12**, 122 (2022).
- (10) **Quantum Assisted Simulation of Time-Dependent Hamiltonians**, *JW Zhong Lau*, *K Bharti*, *T Haug*, *LC Kwek*, [arXiv:2101.07677](#).
- (11) **Generalized Quantum Assisted Simulator**, *T Haug*, *K Bharti*, [arXiv:2011.14737](#).
- (12) **Iterative Quantum Assisted Eigensolver**, *K Bharti*, *T Haug*, *Phys. Rev. A* **104**, L050401 .
- (13) **Optimal Probes for Global Quantum Thermometry**, *WK Mok*, *K Bharti*, *LC Kwek*, *A Bayat*, *Communications Physics*, 2021.
- (14) **Quantum Assisted Eigensolver**, *K Bharti*, [arXiv:2009.11001](#).
- (15) **Graph-Theoretic Approach to Dimension Witnessing**, *M Ray*, *NG Boddu*, *K Bharti*, *LC Kwek*, *A Cabello*, *New Journal of Physics* (2020).
- (16) **Robust Semi-Device-Independent Certification of all Pure Bipartite Maximally Entangled States via Quantum Steering**, *H. Shrotriya*, *K Bharti*, *LC Kwek*, *Physical Review Research* **3**, 033093 (2021).
- (17) **A Universal Uncertainty-Disturbance Relation**, *L. Sun*, *K Bharti*, *Y Mao*, *X Zhou*, *LC Kwek*, *J Fan* and *S Yu*, Offline, In communication with journal.
- (18) **Uniqueness of All Fundamental Noncontextuality Inequalities**, *K Bharti**, *AS Arora**, *LC Kwek*, *J Roland*, *Physical Review Research* **2** (3), 033010.

- (19) **Machine Learning meets Quantum Foundations: A Brief Survey**, *K Bharti, T Haug, V Vedral, LC Kwek*, [AVS Quantum Sci. 2, 034101 \(2020\)](#), [Featured Article](#).
- (20) **Towards Local Certification of Programmable Quantum Devices of Arbitrary High Dimensionality**, *K Bharti**, *M Ray**, *A Varvitsiotis*, *A Cabello*, *LC Kwek*, [arXiv:1911.09448](#).
- (21) **How to Teach AI to Play Bell Non-Local Games: Reinforcement Learning**, *K Bharti, T Haug, V Vedral, LC Kwek*, [arXiv:1912.10783](#).
- (22) **Non-Classical Correlations in n-Cycle Setting**, *K Bharti, M Ray, LC Kwek*, [Entropy 21 \(2\), 134](#).
- (23) **Revisiting the Admissibility of Noncontextual Hidden Variable Models in Quantum Mechanics**, *AS Arora, K Bharti, Arvind*, [Physics Letters A 383 \(9\), 833-837](#).
- (24) **Quantum Key Distribution Protocol Based on Contextuality monogamy**, *J Singh, K Bharti, Arvind*, [Physical Review A 95 \(6\), 062333](#).
- (25) **Convex optimization for non-equilibrium steady states on a hybrid quantum processor**, *JW Zhong Lau*, KH Lim*, K Bharti, LC Kwek, Sai Vinjanampathy*, [arXiv:2204.03203](#).
- (26) **Self-Testing of a Single Quantum System: Theory and Experiment**, *XM Hu*, Y Xie*, AS Arora*, MZ Ai*, K Bharti*, J Zhang, W Wu, PX Chen, JM Cui, BH Liu, YF Huang, CF Li, GC Guo, J Roland, A Cabello, LC Kwek*, [arXiv:2203.09003](#).
*: Equal contribution

Viewpoints

- (27) **Fisher Information: A Crucial Tool for NISQ Research**, *K Bharti*, [Quantum Views 5, 61](#).

Selected Honors and Awards

- 2018 **CQTian of the Year**, *Awarded by Centre for Quantum Technologies, National University of Singapore.*
- 2016–Present **CQT Fellowship**, *Awarded by Centre for Quantum Technologies, National University of Singapore.*
- 2012–2016 **KVPY Fellowship**, *Awarded by Department of Science and Technology, Government of India.*
- 2015 **CSIR Physics JRF NET**, *All India Rank 15 (99+ percentile) .*
- 2015 **Junior Research Fellowship**, *Awarded by Human Resource Development Group, Council of Scientific and Industrial Research, Government of India, Declined.*
- May-July 2015 **DAAD WISE Fellowship**, *Awarded by German Academic Exchange Service.*
- 2011-12 **INSPIRE Fellowship**, *Awarded by Department of Science and Technology, Government of India.*

Teaching

- 2021 Lecturer for A* STAR Quantum Computing Series (NISQ Algorithms)
- 2020 Lecturer for A* STAR Quantum Algorithm Series (Quantum Machine Learning)
- 2017-2019 Instructor for Q-Camp (Quantum Entanglement and Teleportation)
- Spring 2016 TA for Phy 102 (Electricity and Magnetism)
- Fall 2015 TA for Phy 101 (Classical Mechanics)

Mentoring

- 1 **Harshank Shrotriya**, *PhD Student at CQT*, Co-authored “Self Testing of All Pure Bipartite Entangled States via Quantum Steering” .
- 2 **Nur Shahidee**, *Quantum Developer at Entropica Labs*, Working on “Quantum Device Certification”.
- 3 **Jorawar Singh**, *PhD Student at IISER Mohali*, Working on “AI for Bell Nonlocality”.
- 4 **Wai-Keong Mok**, *Undergraduate Student at NUS*, Co-authored “Optimal Probes for Global Quantum Thermometry” and “Noisy Intermediate-Scale Quantum (NISQ) Algorithms”, Working on “NISQ Algorithms”.
- 5 **Kian Hwee Lim**, *PhD Student at CQT*, Co-authored “Fast-Forwarding with NISQ Processors without Feedback Loop”.
- 6 **Jonathan Lau Wei Zhong**, *PhD Student at CQT*, Co-authored “Quantum Assisted Simulation of Time-Dependent Hamiltonians” and “NISQ Algorithm for Hamiltonian Simulation via Truncated Taylor Series”.

Selected Talks

- 2021 **Quantum Contextuality in Quantum Mechanics and Beyond (QCQMB 2021)**, *Local certification of programmable quantum devices of arbitrary high dimensionality*, Invited Talk.
- 2020 **QFTA, India**, *QAE and IQAE: A blueprint for practical quantum advantage*, Invited Talk.
- 2020 **Young Quantum, India**, *Robust self-testing of quantum systems via noncontextuality inequalities*, Contributed Talk.
- 2020 **CQT-SGInnovate Event, Singapore**, *Exploring Horizons of Quantum Machine Learning*, Invited Talk.
- 2020 **IPS meeting 2020, Singapore**, *Near-term quantum algorithms for linear systems of equations*, Invited Talk.
- 2020 **Agency at the Interface of Quantum and Complexity Science, Singapore**, *Near-term quantum algorithms for linear systems of equations*, Contributed Talk.
- 2019 **Asian Quantum Information Science Conference (AQIS), Seoul**, *Robust self-testing of quantum systems via noncontextuality inequalities*, Contributed Talk.

Computer Skills

Languages Python, \LaTeX , R, Matlab, Mathematica

Libraries TensorFlow, Keras, Spinning Up, NumPy, SciPy, Qiskit, pyQuil

References

Prof. Vlatko Vedral

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