Mile Gu

Nanyang Assistant Professor | National Research Foundation Fellow
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Current Positions

07/2021 - Present	**Associate Professor,** Complexity Institute and the School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore.
07/2021 - Present	**Research Associate Professor,** Centre for Quantum Technologies, National University of Singapore

Employment History:

02/2016 – 06/2021	**Nanyang Assistant Professor,** Complexity Institute and the School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore. (80%)
11/2013 - 01/2016	**Assistant Professor,** Center for Quantum Information, Institute for Interdisciplinary Information Sciences, Tsinghua University, China.
10/2009 - 11/2013	**Research Fellow,** Centre for Quantum Technologies, National University of Singapore

Academic Qualifications:

02/2005 - 11/2009	**PhD (**Quantum Complexity, Emergence and Measurement by Computation), University of Queensland, Brisbane, Australia. *Supervisors: Michael Nielsen, Tim Ralph, Andrew Doherty*
02/2003 - 02/2005	**Masters in Physics (**Quantum Optics) *1st Class Honors,* Auckland University, New Zealand, *Supervisors: Scott Parkins, Howard Carmichael*
02/2001 - 12/2002	**Bachelor of Science** (*Triple Major*, in Physics, Computer Science and Applied Mathematics) Auckland University, Auckland, New Zealand.

Research Highlights:

- Discovered ways to model complex process more simply using quantum mechanics. Initial work published in ***Nature Comm. 3, 762, 1133–1135***, catalyzing a new cross-disciplinary field of research. Experimental demonstrations (***Science Advances 3, 2, e160130)***, and examining its fundamental consequences for the origin of time (**Phys. Rev. X** 8, 031013)

- Discovered method to generate potential futures of a stochastic process in quantum superposition (***Phys. Rev. Lett. 120, 240502)***. Proposed this as means to interference of many possible futures for advantaged future inference. The subsequent experimental demonstration (**Nature communications, 10, 1-8**) was named one of the 12 Most Important and Stunning Quantum Experiments of 2019[1]**.**

- Pioneering work in understanding quantum resource theories, developing means to interconverting between resources (***Phys. Rev. Lett.* 116,160407** with 150+ citations in 3 years with subsequent experiment in ***Phys. Rev. Lett.* 121**, 05040).

- Jointly proposed continuous variable cluster state computation – a new model of quantum computation that has ***400+ combined citations***, starting a new research direction. See ***Phys. Rev. A 79, 062318*** *and* ***Phys. Rev. Lett. 97(11):11050.***

- Jointly proved that methods of General Relativity can be applied to find optimal quantum algorithms. Published in ***Science, 311(5764):1133–1135*** and highlighted in ***Science Perspectives*** *on the same issue.*

Overall output of 72 publications/proceedings, including 8 in Physical Review Letters, 5 in Physical Review X, 9 in Nature Communications, 5 in Physical Review X, 1 in Nature Physics, 1 in Nature Photonics, 1 in Science, and 5 in npj Quantum Information. 3700+ cites with H-index of 27 (Google Scholar).

SELECTED GRANTS:

2021-2023 ***Beyond Landauer's Bound: The Fundamental Energetic Limits of Classical and Quantum Information Processing –*** *Ministry of Education, Singapore* ***Role:*** *Principal Investigator*
150,000 SGD

2021 ***Machine-Learned Quantum Models -*** *(National Research Foundation and QEP Singapore)* ***Role:*** *Principal Investigator*
100,000 SGD

2018-2022 ***Validation of Near-Future Quantum Technologies (VanQuTe) –*** *(National Research Foundation, Singapore)* ***Role:*** *Principal Investigator*
429,600 SGD

2020-2022 ***Unifying Quantum Resources: An Overarching Framework for Interconverting and Quantifying Different Forms of Non-Classicality–*** *(Ministry of Education, Singapore)* ***Role:*** *Principal Investigator*
100,000 SGD

2019-2021 ***The role of quantum effects in simplifying adaptive agents –*** *(Foundational Questions Institute, United States)* ***Role:*** *Principal Investigator (Jointly Thomas Elliot)*
70,667.5 USD

2018-2022 ***Designing practical quantum memories for tracking time with absolute precision***
150,000 SGD *(Ministry of Education, Singapore)* ***Role:*** *Principal Investigator*

2016-2021 ***Enhancing the Efficiency of Modelling and Simulating Complex Systems via Quantum Mechanics***
2,606,400 SGD *(National Research Foundation, Singapore)* ***Role:*** *Principal Investigator*

2017-2018 ***Observer-dependent complexity: The quantum-classical divergence over 'what is complex?'***
50,600 USD *(Foundational Questions Institute, United States)* ***Role:*** *Principal Investigator (jointly with Andrew Garner)*

2015-2017 ***Occam's Quantum Mechanical Razor: Can Quantum theory admit the Simplest Understanding of Reality?*** *(The John Templeton Foundation)* ***Role:*** *Principal Investigator*
246,100 USD

[1] See https://www.livescience.com/most-important-surprising-quantum-physics-of-2019.html

2014 ***Using Discord to Preserve the Benefits of Entanglement-Breaking Noise***
200,000 CNY *(National Natural Science Foundation of China)* ***Role:*** *Principal Investigator*

2014-2015 ***1000 Talent Award Research Funds*** *(Organization Department of the CPC Central Committee)*
2,000,000 CNY ***Role:*** *Principal Investigator*

SELECTED AWARDS:

2020 ***Winner of 2020 Quantum Pitch –*** *IBM Singapore*
2019 ***SPMS Teaching Excellence Award*** *– Nanyang Technological University, Singapore*
2019 ***SPMS Young Researcher*** *Award – Nanyang Technological University, Singapore*
2019 ***UWA Institute of Advanced Studies Visiting Fellow –*** *University of Western Australia, Australia*
2016 ***National Research Foundation Fellow –*** *National Research Foundation, Singapore*
2013 ***China Young 1000 Talent -*** *Central Organizing Committee of China*
2013 ***Research Highlight of the Month (January)*** *– National University of Singapore*
2006-2009 ***Australian Postgraduate Award*** *- University of Queensland*
2005 ***Distinguished Scholar Award****, University of Queensland*

SELECTED MEDIA AND PRESS:

- "Quantum thinking can ignore the flow of time," ***New Scientist*** 239, 3188 (2018)
- "Zen and the art of quantum complexity." ***New Scientist,*** *2995, (2014)*
- "Quantum optics: Discord in the Ranks." ***Nature Photonics: News and Views*** 6.11 (2012):
- "Why nature is not the sum of its parts." ***New Scientist*** 200.2676 (2008)
- "Computation: The edge of reductionism." ***Nature: News and Views*** 459.7245 332-334 (2009)
- "Implementing a Quantum Computation by Free Fall." ***Science Perspectives,*** 311.5764 (2006)

KEY SELECTED TALKS:

I have been conducted invited talks/colloquium on 40+ separate occasions, Notable mentions include

1. ***Invited talk and Panellist*** *at FQXi Workshop on Physics of Intelligence and Agency,* 2019
   Youtube Link: **[**https://www.youtube.com/watch?v=SjAgNw4o4mQ**]**

2. ***Invited colloquium*** *at Para Limes Conference on Causality – Reality, 2017*
   Youtube Link **[**https://www.youtube.com/watch?v=ikk2HAfW6gA**]**

TEACHING EXPERIENCE:

- ***Design and Teaching of 'Physics of Classical and Quantum Information' at NTU*** *(2017 - 2020)*
  When taking position at NTU, my first proposal to the department as the need for the university to have a dedicate course introducing undergraduates to the interface between physics and information, including quantum information, complexity, and the thermodynamics of information. This involved complete design, of, course curricula, assignment modules and test modules, tutorial questions, customized notes. The course is presently the only undergraduate course covering quantum information in Singapore, is extremely well-received, receiving a student feedback score of 4.96/5.00 in the most recent Academic Year (AY2019/2020) together with excellent verbal feedback (sample below)

  - *"This is probably one of the best courses I've taken in NTU and there are many good things to say about it. For one, the design of the course materials is excellent. The weekly summary sheets helped me to be*

more focused in my revision and the tutorial/assignment problems were very well designed. Moreover, the assigned recommended readings were carefully curated and Prof Gu was very clear about which readings were crucial. In terms of the lectures, Prof Gu is always very enthusiastic and clear in his presentations and I looked forward to attending his class every Monday. I think the best thing about this course is that it makes advanced concepts accessible to 3rd and even 2nd-year physics undergraduates."

- ***Design and Teaching of 'Linear Algebra for Scientists' at NTU*** *(2018 - 2020)*
  In 2018, the NTU school of computer science and software engineering entered partnership with the School of mathematical a physical science to create a joint bachelor's degree on Data Science. As part of this, they wanted a Linear Algebra specifically tailored for data science and physics majors which emphasized its applications to these fields. I volunteered in the design and of this course, including curricular, test modules, tutorial questions and customized notes.

  - *One of the most enthusiastic, engaging and welcoming lecturers in NTU. Always approached us and asked for feedbacks along the semester. He is able to make difficult concepts fun and easily understood. He encourages basic understanding and use it to tackle tougher concepts and questions, instead of root memorization.*

- ***Design and Teaching of 'Physics of Information' at Tsinghua University*** *(2014-2015)*
  While faculty at Tsinghua University, I design a the course 'Physics of Information,' a highly experimental course for 1st year undergraduate students in the 'Yao Class' at Tsinghua University – a selection of 30 elite students handpicked by Turing-award winner Andrew Yao who are the put into a special curriculum aimed to cultivate research scientists in computer science. The course aimed to expand the horizons of these elite students, introducing advanced concepts (e.g. quantum information, quantum computing, Maxell's demons) to freshman students. After its immensely positive reception, it was designated a core course of the program.

SUPERVISION EXPERIENCE:

Graduated PhD students:

	Name	***After Graduation***
1.	**Ma Jiajun** *2013-2017*	*Senior Scientist at QuantumCTek, a pioneer company in China specializing in quantum communication technologies*
2.	**Chengran Yang** *2016-2020*	*Research Fellow at Centre for Quantum Technologies, National University of Singapore*

Current PhD students:

	Name	Topic	Expected Duration
1.	**Qing Liu**	*Quantum-Enhanced Modelling and Machine-Learning*	08/2016 - 02/2021
2.	**Mathew Ho**	*Complexity and Structure in the Quantum Regime*	08/2017 - 08/2021
3.	**Alexander Michael Wozniakowski**	*Machine-Learning Enhancement of Quantum Devices*	02/2018 - 02/2022
4.	**Minjeong Song** (SING Award)	*Quantum-Information in Space-time*	08/2019 - 02/2023
5.	**Ximing Wang**	*Variation Quantum Circuits*	08/2019 - 02/2023
6.	**Tham Guo Yao** (Nanyang Presidential Scholarship)	*Quantum Sensing and Illumination*	08/2019 - 02/2023

In addition, I have also supervised 4 Final Year project students, 3 of which are now pursuing PhD students degrees in related area of quantum information.

PROFESSIONAL SERVICES:

- **Organizer of multiple workshops**, e.g. the Workshop on interdisciplinary frontiers of quantum and complexity science 2017 (qcomplexity.quantumlah.org), Nanyang Quantum 2017 (quantumcomplexity.org/nyquantum2017).
- **PhD Admission Panelist** for the Institute for Information Sciences, Tsinghua University 2013 – 2015 and School of Physical and Mathematical Sciences, Nanyang Technological University 2018 - 2019
- **Referee** for Physics Rev Lett, Nature Photonics, Phys. Rev. Lett. Phys Rev X. New Journal of Physics, Nature Partner Journal: Quantum information), 2008 - present
- **Assistant Editor** for Nature partner journal: quantum information, 2018
- **Program Committee** of AQIS 2019
- **Advisory committee** for the Korean photonic quantum simulation research project.
- **Thesis Assessor** for 2 PhD students (1 from NTU, 1 from Australian National University), and 1 Masters Student (University of Western Australia)

FULL PUBLICATION LIST:

Journal Publications

1. **Thomas J Elliott, Mile Gu, Andrew Garner, Jayne Thompson,** Quantum adaptive agents with efficient long-term memories, Physical Review X 12 (1), 011007

2. **Christina Ioannou, Ranjith Nair, Ivan Fernandez-Corbaton, Mile Gu, Carsten Rockstuhl, Changhyoup Lee,** Optimal circular dichroism sensing with quantum light: Multiparameter estimation approach, Physical Review A 104 (5), 052615

3. **Alex Wozniakowski, Jayne Thompson, Mile Gu, Felix C Binder,** A new formulation of gradient boosting, Machine Learning: Science and Technology 2 (4), 045022

4. **Paul M Riechers, Mile Gu,** Impossibility of achieving Landauer's bound for almost every quantum state, Physical Review A 104 (1), 012214

5. **Xiao Yuan, Yunchao Liu, Qi Zhao, Bartosz Regula, Jayne Thompson, Mile Gu,** Universal and operational benchmarking of quantum memories, npj Quantum Information, 7 1-8

6. **Mark Bradshaw, Lorcán O Conlon, Spyros Tserkis, Mile Gu, Ping Koy Lam, Syed M Assad,** Optimal probes for continuous-variable quantum illumination, *Physical Review A 103 (6), 062413*

7. **Paul Riechers. Mile Gu,** Initial-state dependence of thermodynamic dissipation for any quantum process. *Physical Review E*, *103*(4), p.042145, 2021

8. **Varun Narasimhachar, Syed Assad, Felix Binder, Jayne Thompson, Benjamin Yadin, Mile Gu,** Thermodynamic resources in continuous-variable quantum systems, *npj Quantum Information 7, 9, 2021*

9. **Hui Zhang, Mile Gu, Xu Dong Jiang, Jayne Thompson, Hong Cai, Stefano Paesani, Raffaele Santagati, Anthony Laing, Yi Zhang, Man-Hong Yung, Yu Zhi Shi, Faeyz K. Muhammad, Guo-Qiang Lo, Xian Shu Luo+, Bin Dong, Dim-Lee Kwong, Leong Chuan Kwek, Ai Qun Liu,** An optical neural chip for implementing complex-valued neural network, *Nature Communications,12, 457,* 2021

10. **Pengfei Wang, Chun-Yang Luan, Mu Qiao, Mark Um, Junhua Zhang, Ye Wang+, Xiao Yuan, Mile Gu, Jingning Zhang, Kihwan Kim,** Single ion qubit with estimated coherence time exceeding one hour, *Nature Communications 12, 233*, 2021

11. **Thomas J. Elliott, Chengran Yang, Felix C. Binder, Andrew J. P. Garner, Jayne Thompson, Mile Gu,** Extreme Dimensional Compression with Quantum Modeling, Physica Review Letters. 125, 260501, 2020

12. **Spyros Tserkis, Jayne Thompson, Austin P. Lund, Timothy C. Ralph, Ping Koy Lam, Mile Gu, and Syed M. Assad,** Maximum entanglement of formation for a two-mode Gaussian state over passive operations, Physical Review A 102, 052418, 2020

13. **Syed M. Assad, Mile Gu, Xiaoying Li, and Ping Koy Lam,** Decoupling cross-quadrature correlations using passive operations, Physical Review A 102, 022615, 2020

14. **Pengfei Wang, Chun-Yang Luan, Mu Qiao, Mark Um, Junhua Zhang, Ye Wang, Xiao Yuan, Mile Gu, Jingning Zhang, Kihwan Kim,** Single ion qubit with estimated coherence time exceeding one hour, Nature Communications volume 12, 233, 2020

15. **Yang Xiaodong, Jayne Thompson, Ze Wu, Mile Gu, Xinhua Peng, and Jiangfeng Du.** Probe optimization for quantum metrology via closed-loop

learning control. *Nature Partner Journal: Quantum Information, 6, 1-7, 2020*

16. ***Chengran Yang; Felix Binder; Mile Gu; Thomas Elliott,*** Measures of distinguishability between stochastic processes*, Physical Review. E 101, 062137*

17. **Ranjith Nair** and **Mile Gu**, Fundamental limits of quantum illumination, *Optica 7, 7*, pp. 771-774, 2020

18. **Mathew Ho, Mile Gu, Thomas Elliott,** Robust inference of memory structure for efficient quantum modelling of stochastic processes, *Phys. Rev. A 101, 032327,* 2020

19. **Jie Zhao, Kui Liu, Hao Jeng, Mile Gu,** Jayne Thompson, Ping Koy Lam, and Syed M. Assad, A high-fidelity heralded quantum squeezing gate, *Nature Photonics 14, 5, 306-309, 2020*

20. **Bartosz Regula, Varun Narasimhachar, Francesco Buscemi, and Mile Gu,** Coherence manipulation with dephasing-covariant operations, *Phys. Rev. Research 2*, 013109, 2020

21. **W. Wang, J. Han, B. Yadin, Y. Ma, J. Ma, W. Cai, Y. Xu, L. Hu, H. Wang, Y. P. Song, Mile Gu, and L. Sun,** Witnessing quantum resource conversion within deterministic quantum computation using one pure superconducting qubit. *Physical Review Letters, 123*, 220501, 2019

22. **Kuan Zhang, Jayne Thompson, Xiang Zhang, Yangchao Shen, Yao Lu, Shuaining Zhang, Jiajun Ma, Vlatko Vedral, Mile Gu, Kihwan Kim.** *Modular Quantum Computation in a Trapped Ion System. Nature communications 10, 1-6* 2019

23. **Farzad Ghafari, Nora Tischler, Jayne Thompson, Mile Gu, Lynden K Shalm, Varun B Verma, Sae Woo Nam, Raj B Patel, Howard M Wiseman, Geoff J Pryde,** Dimensional Quantum Memory Advantage in the Simulation of Stochastic Processes, *Physical Review X* 9 4, 041013, 2019

24. **Regula, Bartosz; Fang, Kun; Wang, Xin; Gu, Mile,** One-shot entanglement distillation beyond local operations and classical communicatio**n,** New Journal. Physics. 21 103017

25. **Liu Qing, Thomas J. Elliott, Felix C. Binder, Carlo Di Franco, and Mile Gu.** "*Optimal stochastic modeling with unitary quantum dynamics*." Physical Review A 99, 6, 062110, 2019

26. **Varun Narasimhachar, Jayne Thompson, Jiajun Ma, Gilad Gour, and Mile Gu,** Quantifying memory capacity as a quantum thermodynamic resource**,** *Physical Review Letters* 122, 060601, 2019 #

27. **Farzad Ghafari, Nora Tischler, Carlo Di Franco, Jayne Thompson, Mile Gu and Geoff Pryde,** *Interfering Trajectories in experimental quantum enhanced stochastic simulation*, Nature Communications, 10, 1630 ***Top 1% of all publications by Altmetric***

28. **Gabriel Aguilar, M. A. de Souza, R. M. Gomes, Jayne. Thompson, Mile Gu, Lucas Céleri, and Stephen Walborn.** *Experimental investigation of linear-optics-based quantum target detection.* Physical Review A 99, 5, 053813, 2019

29. **Thomas Elliott, Andrew Garner and Mile Gu,** *Memory-efficient tracking of complex temporal and symbolic dynamics with quantum simulators*, New Journal of Physics, 21 013021, 2019

30. **Chengran Yang, Felix C. Binder, Varun Narasimhachar, and Mile Gu** *Matrix product states for quantum stochastic modelling*, Physical Review Letters, 121, 26, 260602, 2018

31. **Benjamin Yadin, Varun Narasimhachar, Felix Binder, Jayne Thompson, Mile Gu, Myungshik Kim,** *Operational resource theory of continuous-variable non-classicality*, Physical Review X 8 (4), 041038, 2018

32. **Zhikuan Zhao, Robert Pisarczyk, Jayne Thompson, Mile Gu, Vlatko Vedral, Joseph F Fitzsimons,** *Geometry of quantum correlations in space-time*, Physical Review A 98, 5, 052312, 2018

33. **Kang-Da Wu, Zhibo Hou, Yuan-Yuan Zhao, Guo-Yong Xiang, Chuan-Feng Li, Guang-Can Guo, Jiajun Ma, Qiong-Yi He, Jayne Thompson, Mile Gu.** *Experimental cyclic inter-conversion between Coherence and Quantum Correlations.* Physical Review Letters 121 (5), 05040, 2018

34. **Jayne Thompson, Andrew Garner, John Mahoney, James Crutchfield, Vlatko Vedral, Mile Gu.** *Causal Asymmetry in a Quantum World*, Physical Review X 8, 3, 031013, 2018, Featured in New Scientist, ***Top 1% of all publications by Altmetric***

35. **Felix Binder, Jayne Thompson, Mile Gu,** *Practical unitary simulator for non-Markovian complex processes.* Phys. Rev. Lett. 120, 240502, 2018

36. **Adán Cabello, Mile Gu, Otfried Gühne, Zhen-Peng Xu.** *Optimal Classical Simulation of State-Independent Quantum Contextuality. Physical Review Letters*

120, 130401, 2018

37. **Kuan Zhang; Ma Jiajun; Xiang Zhang; Jayne Thompson; Vlatko Vedral~; Kihwan Kim; Mile Gu,** Operational effects of the UNOT gate on classical and quantum correlations, *Science Bulletin* 63, 12, 765-770, 2018

38. **Thomas Elliott and Mile Gu.** *Superior memory efficiency of quantum devices for the simulation of continuous-time stochastic processes.* Nature Partner Journal: Quantum Information*, 4, 18, 2018.* ***Top 5% of all publications by Altmetric***

39. **Jayne, Thompson, Kavan Modi, Vlatko Vedral, and Mile Gu.** *Quantum plug n'play: modular computation in the quantum regime.* New Journal of Physics 20, no. 1, 013004, 2018

40. **Xiao Yuan, Hongyi Zhou, Mile Gu, and Xiongfeng Ma.** *Unification of nonclassicality measures in interferometry*, Phys. Rev. A 97, 012331, 2018

41. **Suen Whei Yeap, Jayne Thompson, Andrew Garner, Vlatko Vedral, Mile Gu,** *The classical-quantum divergence of complexity in the Ising spin chain*, Quantum *1, 25, 2017*

42. **Andrew Garner, Qing Liu, Jayne Thompson, Vlatko Vedral, and Mile Gu**. *Provably unbounded memory advantage in stochastic simulation using quantum mechanics*. New Journal of Physics, 19, 103009 2017

43. **Andrew Garner, Jayne Thompson, Vlatko Vedral, and Mile Gu.** *Thermodynamics of complexity and pattern manipulation*. Physical Review E 95, 4. 042140, 2017

44. **Matthew Palsson, Mile Gu, Joseph Ho, Howard Wiseman, Geoff Pryde** *Experimental quantum processing enhancement in modelling stochastic processes*, Science Advances Vol. 3, no. 2, e160130 , 2017, ***Top 5% of all publications by Altmetric***

45. **Jayne Thompson, Andrew Garner, Vlatko Vedral, Mile Gu***, *Using quantum theory to reduce the complexity of input-output processes*, Nature partner journal: Quantum Information, 3, 1, 2017 ***Top 5% of all publications by Altmetric***

46. **Mark Bradshaw, Syed M. Assad, Jing Yan Haw, Si-Hui Tan, Ping Koy Lam, Mile Gu***, *Overarching framework between Gaussian quantum discord and Gaussian quantum illumination*, Phys. Rev. A 95, 022333, *2017*

47. **Jiajun Ma, Benjamin Yadin, Davide Girolami, Vlatko Vedral, and Mile Gu*** *Converting Coherence to Quantum Correlations.* Physical review letters 116, 16 160407, 2016 ***190+ Citations.***

48. **Cabello, Adán, Mile Gu, Otfried Gühne, Jan-Åke Larsson, and Karoline Wiesner.** *Thermodynamical cost of some interpretations of quantum theory*. Physical Review A 94, 05212, *2016* (Featured in Physics Today, DOI:10.1063/PT.5.7331)

49. **Nana Liu, Jayne Thompson, Christian Weedbrook, Seth Lloyd, Vlatko Vedral, Mile Gu, and Kavan Modi.** *Power of one qumode for quantum computation.* Physical Review A 93, 5 052304, 2016

50. **Hugo Cable, Mile Gu, Kavan Modi,** *Power of one bit of quantum information in quantum metrology*, Physical Review A 93, 4, 040304, 2016

51. **B. Yadin, J. Ma, D. Girolami, M. Gu, V. Vedral,** *Quantum processes which do not use coherence*, Physical Review X 6, 041028, *2016* ***90+ Citations.***

52. **Christian Weedbook, Stefano Pirandola, Jayne Thompson, Vlatko Vedral, and Mile Gu***. *How discord underlies the noise resilience of quantum illumination.* New Journal of Physics 18, 4, 043027*, 2016* ***30+ Citations.***

53. **Su, Hong-Yi, Changliang Ren, Jing-Ling Chen, Fu-Lin Zhang, Chunfeng Wu, Zhen-Peng Xu, Mile Gu, Sai Vinjanampathy, and Leong Chuan Kwek.** *Beating the Clauser-Horne-Shimony-Holt and the Svetlichny games with optimal states*. Physical Review A *93, 022110, 2016:*

54. **Xiao Yuan, Syed M. Assad, Jayne Thompson, Jing Yan Haw, Vlatko Vedral, Timothy C. Ralph, Ping Koy Lam, Christian Weedbrook and Mile Gu*** *Replicating the benefits of closed timelike curves without breaking causality".* Nature Partner Journal*: Quantum Information 1, 15007, 2015 (Named Research Highlight in Nature Physics 12, 20).* ***Top 1% of all publications by Altmetric***

55. **F. Franchini, J. Cui, L. Amico, H. Fan, M.Gu, V. Korepin, L. Kwek, V. Vedral.** *Local convertibility and edge states in quantum many body systems,* Phys. Rev. X *4, 041028* 2014

56. **M. de Almeida, M Gu, A Fedrizzi, M.A. Broome, T.C. Ralph, A. White.** *Entanglement-free certification of entangling gates,* Physical Review A 89, 042323, 2014

57. **S.Sridharan, M. McEneaney, M.Gu, M. James.** *A reduced complexity min-plus solution method to the optimal control of closed quantum systems*. Applied

Mathematics & Optimization, 1-42, 2014

58. **Tan, Ryan, Daniel R. Terno, Jayne Thompson, Vlatko Vedral, and Mile Gu** *Towards Quantifying Complexity with Quantum Mechanics.* EPJ Plus 129, 9, 1-12, 2014

59. **X. Cai, C. Weedbrook, Z. Su, M. Chen, M. Gu, M. Zhu, L. Li, N. Liu, C. Lu, J. Pan.** *Experimental Quantum Computing to Solve Systems of Linear Equations* Phys. Rev. Lett, 2013, ***70+ Citations.***

60. **J. Cui, L. Amico, H. Fan, M. Gu, A. Hamma, V. Vedral.** *Local characterization of 1d topologically ordered states.* Phys. Rev. B. 88, 125117, 2013

61. **M. Gu, H. Chrzanowski, S. Assad, T. Symul, K. Modi, T. C.Ralph, V.Vedral, P.K. Lam***. *Observing the operational significance of discord consumption,* Nature Physics 8, 671–675, 2012. ***200+ Citations*** *(Featured on Nature Photonics, and New Scientist)*

62. **M. Gu, K. Wiesner, E. Rieper, V. Vedral.** *Quantum Mechanics can reduce the complexity of classical models.* Nature Communications 3, 762, 2012 *(Featured in New Scientist)* ***70+ Citations.***

63. **J. Cui, M. Gu, L.C. Kwek, M.F. Santos, H. Fan, V. Vedral.** *Quantum phases with differing computational power.* Nature Communications 3, 812, 2012. ***60+ Citations.***

64. **K. Modi, M. Gu.** *Coherent and Incoherent Contents of Correlations,* International Journal of Modern Physics B, 27 , 2012.

65. **M. Gu, A. Perales.*** *Encoding Universal Computation in the Ground States of Ising Lattices,* Phys. Rev. E. 86, 1:011116, 2012.

66. **K. Wiesner, M Gu, E. Rieper, V. Vedral.** *Information-theoretic bound on the energy cost of stochastic simulation,* Proceedings of the Royal Society A, 468, 4058–4066, 2012

67. **M. Gu, C.Weedbrook, P. van Loock, and N.Menicucci, Timothy C. Ralph.** Quantum *computing with continuous variable clusters.* Phys. Rev. A, 79:063218, 2009. ***180+ Citations***

68. **S. Sridharan, M. Gu, M.R. James, W. M. McEneaney.** *Reduced-complexity numerical method for optimal gate synthesis*. Phys. Rev. A, 82:042319, 2010.

69. **S. Sridharan, M. Gu, M.R. James, W. M. McEneaney** *An efficient computational method for the optimal control of higher dimensional quantum systems*. 2010 49th IEEE Conference on Decision and Control (CDC), 2010.

70. **M. Gu, C.Weedbrook, A. Perales, and M. Nielsen.*** *More really is different*. Physica D. 238, 835-839, 2009. (Featured in Nature 459, 332-334 and New Scientist 2676)

71. **P. van Loock, C.Weedbrook, and M. Gu.** *Building Gaussian cluster states by linear optics*. Phys. Rev. A, 76(3):032321, 2007. ***110+ Citations.***

72. **S. Sridharan, M. Gu, and M. James**. *Gate complexity using dynamic programming*. Phys. Rev. A, 78(5):052327, 2008.

73. **M. Gu, A. Doherty, and M. Nielsen.** *Quantum control via geometry: An explicit example*. Phys. Rev. A, 78(3):032327, 2008.

74. **NC Menicucci, P Van Loock, M Gu, C Weedbrook, TC Ralph, MA Nielsen.** *Universal quantum computation with continuous-variable cluster states*. Physical review letters 97 (11), 110501. ***450+ Citations.***

75. **M. Nielsen, M. Dowling, M. Gu, and A. Doherty.** *Quantum computation as geometry*. Science, 311(5764):1133–1135, 2006. ***180+ Citations.***

76. **M. Nielsen, M. Dowling, M. Gu, and A. Doherty.** *Optimal control, geometry, and quantum computing*. Phys. Rev. A, 311(5764):062323, 2006. ***70+ Citations***

77. **M. Gu, and A. S Parkins, and H. J. Carmichael.*** *Entangled-state cycles from conditional quantum evolution*. Phys. Rev. A. 93:043813, 2006.

78. **Stephen Clark, Amy Peng, Mile Gu, and Scott Parkins**. *Unconditional Preparation of Entanglement between Atoms in Cascaded Optical Cavities*. Phys.Rev.Lett. 91:177901, 2003. ***150+ Citations***

Book Chapters

79. **Mile Gu, Stefano Pirandola,** *Discord, quantum knowledge and private communications,* Lectures on General Quantum Correlations and their Applications, *231-239, 2017*

Conference Proceedings

80. **Helen Chrzanowski, Mile Gu, Syed Assad, Thomas Symul, Kavan Modi, Timothy Ralph, Vlatko Vedral, Ping Koy Lam.** *Discord as a quantum resource for bi-partite communication*. AIP Conference Proceedings 1633, 116-118, 2014

81. **Sara Hosseini, Saleh Rahimi-Keshari, Jing Yan Haw, Syed Assad, Helen Chrzanowski, Jiri Janousek, Thomas Symul, Timothy Ralph, Ping Koy Lam, Mile Gu, Kavan Modi, Vlatko Vedral,** *Experimental Verification of Quantum Discord and Operational Significance of Discord Consumption, CLEO: QELS_Fundamental Science, FTh3A. 6, 2014*

82. **Thomas Symul, Helen Chrzanowski, Syed Assad, Ping Koy Lam, Timothy Ralph, Mile Gu, Kavan. Modi, and Vlatko. Vedral.** *Operational Significance of Discord Consumption*, International Quantum Electronics Conference, paper IB_6_6, 2013

83. **Syed Assad, Helen Chrzanowski, Thomas Symul, Ping Koy Lam, Tim Ralph, Mile Gu, Vlatko Vedral,** *A functional interpretation of continuous variable quantum discord,* Quantum Electronics Conference & Lasers and Electro-Optics (CLEO/IQEC/PACIFIC RIM), 2011

84. **Sara Hosseini, Saleh Rahimi-Keshari, Jing Yan Haw, Syed M Assad, Helen M Chrzanowski, Jiri Janousek, Thomas Symul, Timothy C Ralph, Ping Koy Lam, Mile Gu, Kavan Modi, Vlatko Vedral,** *Experimental verification of quantum discord in continuous-variable states and operational significance of discord consumption*, 2014 Conference on Lasers and Electro-Optics (CLEO) - Laser Science to Photonic Applications, pp. 1-2, 2014

85. **Srinivas Sridharan, Mile Gu, Matthew R James, William M McEneaney,** *An efficient computational method for the optimal control of higher dimensional quantum systems*, Decision and Control (CDC), 2010 49th IEEE Conference on, 2996-3001, 2010

Other Creative Works

86. **Gu, Mile.** *Computing with Quantum Cats: From Colossus to Qubits: Review* Physics Today 68, 1 46-47. 2015

87. **Gu, Mile, and Vlatko Vedral.** *Zen and the art of quantum complexity*. New Scientist 224, 2995, 28-29. 2014