Xin Wang

Curriculum Vitae

Thrust of Artificial Intelligence, Information Hub
Hong Kong University of Science and Technology (Guangzhou)
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RESEARCH INTERESTS

Quantum Information Theory, Quantum Machine Learning, Quantum Resource Theory, Optimization, Quantum Software, Quantum Algorithms, Quantum Simulation, Quantum Error Correction and Mitigation, Quantum Computing Architecture.

RESEARCH POSITIONS

06/2023–present	**Associate Professor**, Thrust of Artificial Intelligence, Information Hub, Hong Kong University of Science and Technology (Guangzhou), China.
07/2019–05/2023	**Staff Researcher and Tech Leader**, Institute for Quantum Computing, Baidu Research, Baidu Inc., Beijing, China.
09/2018–07/2019	**Hartree Fellow**, Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland, College Park, MD. Supervisor: Andrew Childs.

EDUCATION

08/2014–08/2018	**Ph.D. in Quantum Information**, *University of Technology Sydney*. Supervisors: Prof. Runyao Duan and Prof. Andreas Winter (external) Thesis: Semidefinite Optimization for Quantum Information (2018 Chancellor's List for Outstanding Thesis, Top 7 across the university.)
09/2010–06/2014	**Bachelor of Science**, *Department of Mathematics, Sichuan University*, with an honor degree degree from the Wu Yuzhang Honors College.

AWARDS AND HONORS

2023	The Worlds Top 2% Scientists 2023 (published by Stanford University).
2022	**National Young Talents Project** (Highest national recognition in China for excellent youth working in science and engineering).
2022	Top Young Chinese Scholars in Artificial Intelligence (150 young Chinese scholars who have made outstanding contributions to AI).
2021	Technology Innovation Award (Project co-leader of Quanlse), Baidu Inc.
2020	Technology Innovation Award (Core member of Quantum Leaf), Baidu Inc.
2020	Technology Pioneer Award (Top 6 in Technology Platform Group), Baidu Inc.
2020	Technology Innovation Award (Project Leader of Paddle Quantum: a quantum machine learning toolkit), Baidu Inc.
2020	**Invited Keynote at TQC 2020** (15th Conference on the Theory of Quantum Computation, Communication and Cryptography).
2018	QuICS Hartree Fellowship, University of Maryland, College Park.
2018	**Chancellor's List for Outstanding Thesis** (top seven outstanding theses across UTS).

2018 Outstanding Self-financed Overseas Student Award (500 recipients among all the self-financed overseas students from China; Awarded by China Scholarship Council).

2018 UTS Post Thesis Publication Award.

2017 FEIT Higher Degree by Research Publication Award, UTS.

REFEREED CONFERENCE TALKS

The Conference on Quantum Information Processing (QIP, 7 talks) is the premier and most competitive conference in theoretical aspects of quantum information science and features only the most important advances each year. AQIS (4 long+13 short talks) and TQC (5 talks + 1 **invited talk**) are both international leading conferences in the field of quantum information science, and ISIT is the main event in information theory (8 talks). In the following list, (*) indicates delivery by my co-author.

07/2022* **AQIS 2023 (long talk)**, *Estimate distillable entanglement and quantum capacity by squeezing useless entanglement* , Korea Institute for Advanced Study, Korea.

07/2022* **AQIS 2023**, *Quantum Phase Processing and its Applications in Estimating Phase and Entropies*, Korea Institute for Advanced Study, Korea.

07/2022* **TQC 2022**, *Information recoverability of noisy quantum states*, University of Illinois at Urbana-Champaign, USA.

08/2021* **AQIS 2021**, *LOCCNet: a machine learning framework for distributed quantum information processing*, University of Tokyo, Japan.

08/2021* **AQIS 2021**, *Noise-Assisted Quantum Autoencoder*, University of Tokyo, Japan.

08/2021* **AQIS 2021**, *Variational Quantum Algorithms for Trace Distance and Fidelity Estimation*, University of Tokyo, Japan.

08/2021* **AQIS 2021**, *A Hybrid Quantum-Classical Hamiltonian Learning Algorithm*, University of Tokyo, Japan.

08/2021* **AQIS 2021**, *Symmetric distinguishability as a quantum resource*, University of Tokyo, Japan.

06/2021* **TQC 2021**, *Bounding the classical capacity of a quantum channel assisted by classical feedback*, University of Latvia, Riga, Latvia.

06/2021* **TQC 2021**, *Measurement Error Mitigation via Truncated Neumann Series*, University of Latvia, Riga, Latvia.

06/2021* **ISIT 2021**, *Upper bound on the classical capacity of a quantum channel assisted by classical feedback*, Melbourne, Australia.

06/2020 **TQC 2020**, *Optimizing the fundamental limits for quantum and private communication*, University of Latvia, Riga, Latvia.

06/2020* **ISIT 2020**, *Quantification of Unextendible Entanglement and Its Applications in Entanglement Distillation*, Los Angeles, USA.

01/2020 **QIP 2020**, *Quantifying the magic resources for quantum computation*, Peng Cheng Laboratory and SUSTECh, Shenzhen, China.

01/2020 **QIP 2020**, *Resource theory of asymmetric distinguishability*, Peng Cheng Laboratory and SUSTECh, Shenzhen, China.

01/2019 **QIP 2019**, *Entanglement cost of quantum state preparation and channel simulation*, JILA, University of Colorado Boulder, USA.

02/2019* **SQuInT 2019**, *Exact entanglement cost of quantum states and channels under PPT-preserving operations*, CQuIC, Albuquerque, New Mexico, USA.

03/2019 **APS March meeting**, *Entanglement cost of quantum state preparation and channel simulation*, APS March meeting, Boston, USA.

08/2019 **AQIS 2019 (long talk)**, *Efficiently computable bounds for magic state distillation*, Korea Institute for Advanced Study, Seoul, Korea.

08/2019 **AQIS 2019**, *Resource theory of asymmetric distinguishability*, Korea Institute for Advanced Study, Seoul, Korea.

01/2018 **QIP 2018**, *On converse bounds for classical communication over quantum channels*, QuTech, Delft, Netherlands.

*01/2018 **QIP 2018**, *Efficiently computable upper bounds for quantum communication*, QuTech, Delft, Netherlands.

*07/2018 **TQC 2018**, *Quantum Channel Simulation and the Channel's Smooth Max Information*, UTS, Sydney, Australia.

*09/2018 **AQIS 2018**, *Distillation of quantum coherence in non-asymptotic settings*, Nagoya University, Nagoya, Japan.

06/2018 **ISIT 2018**, *On finite blocklength converse bounds for classical communication over quantum channels*, Vail, Colorado, USA.

06/2018 **ISIT 2018**, *Converse bounds for classical communication over quantum broadcast channels and quantum multi-access channels*, Vail, Colorado, USA.

*06/2018 **ISIT 2018**, *Quantum Channel Simulation and the Channel's Smooth Max Information*, Vail, Colorado, USA.

01/2017 **QIP 2017**, *Asymptotic entanglement manipulation under PPT operations: new SDP bounds and irreversibility*, Microsoft Research, Redmond, USA.

01/2017 **QIP 2017**, *Semidefinite programming strong converse bounds for quantum channel capacities*, Microsoft Research, Redmond, USA.

09/2017 **AQIS 2017 (long talk, top 10%** of all submissions), *Irreversibility of Asymptotic Entanglement Manipulation Under PPT-preserving Operations*, NUS, Singapore.

*09/2017 **AQIS 2017 (long talk, top 10%** of all submissions), *Non-asymptotic entanglement distillation*, National University of Singapore, Singapore.

*09/2017 **AQIS 2017**, *Semidefinite programming converse bounds for quantum communication*, National University of Singapore, Singapore.

*09/2017 **AQIS 2017**, *Approximate broadcasting of quantum correlations*, National University of Singapore, Singapore.

06/2017 **ISIT 2017**, *Semidefinite programming converse bounds for classical communication over quantum channels*, RWTH Aachen University, Aachen.

08/2016 **AQIS 2016**, *Separation between quantum Lovász number and entanglement-assisted zero-error classical capacity*, Academia Sinica, Taipei.

*08/2016 **AQIS 2016**, *Improved Semidefinite Programming Upper Bound on Distillable Entanglement and Non-additivity of Rains' Bound*, Academia Sinica, Taipei.

*08/2016 **AQIS 2016**, *Tripartite-to-bipartite entanglement transformation by SLOCC and the classification of matrix spaces*, Academia Sinica, Taipei.

07/2016 **ISIT 2016**, *A semidefinite programming upper bound of quantum capacity*, Barcelona.

07/2016 **ISIT 2016**, *On the quantum no-signalling assisted zero-error simulation cost of non-commutative bipartite graphs*, Barcelona.

INVITED TALKS

12/2023 **Entanglement Cost for Preparing and Distinguishing Quantum States**. Quantum Resources 2023, Nanyang Technological University, Singapore.

10/2023 **Power of quantum measurement in simulating unphysical operations**. The 7th National Symposium of Young Scholars in Quantum Physics, Wuxi.

08/2023 **Quantum Phase Processing for Eigen-information Processing and Quantum Machine Learning**. International Workshop on Quantum Characterization, Verification, and Validation (IWQCVV) Fudan University, Shanghai.

08/2023 **Quantum Phase Processing for Eigen-information Processing and Quantum Machine Learning**. Joint IOP-CPS symposium on Quantum Information, 2023 CPS Fall Meeting Ningxia University, Yinchuan.

07/2023 **Estimate distillable entanglement and quantum capacity**. Quantum Theory and Operator Theory satellite conference (QTOT) of the International Congress of Basic Science, Beijing, China.

11/2022 **Paddle Quantum - Theory and Practice of Quantum Artificial Intelligence**. China National Computer Congress (CNCC) 2022, China Computer Federation, Guiyang, China.

11/2022 **Understanding quantum entanglement via optimization**. Workshop on Optimization and Applications, AMSS, CAS, Beijing, China.

07/2022 **Quantum Artificial Intelligence**. Tech Frontier 64, China Computer Federation.

06/2022 **Information recoverability of noisy quantum states and error mitigation**. Workshop on Universal Quantum Computing and Information Theory, Institute of Theoretical Physics, CAS, Beijing, China.

07/2021 **Paddle Quantum: Towards Quantum Artificial Intelligence**. ICML 2021 Expo Workshop, online.

12/2020 **Near-term Quantum Algorithms for Quantum Information**. Workshop on Quantum Computing and Quantum Information, Institute of Physics, CAS, Beijing, China.

12/2020 **Cost of quantum entanglement simplified**. AMSS-UTS Joint Workshop on Quantum Computing, AMSS, CAS and UTS.

07/2020 **Variational quantum algorithms for state preparation and matrix decomposition**. Center for Quantum Computing, Peng Cheng Laboratory, Shenzhen, China.

06/2020 **Quantum resource theories of quantum channels**. TQC 2020 (virtual), University of Latvia, Riga, Latvia.

07/2019 **Quantifying the magic resources for quantum computation**. Institute for Quantum Computing, University of Waterloo, Waterloo, Canada.

07/2019 **Quantifying the magic resources for quantum computation**. BIRS workshop on Algebraic and Statistical ways into Quantum Resource Theories, Banff, Canada.

06/2019 **Introduction to quantum computing (lectures and tutorials)**, Illinois Quantum Computing Summer School, Chicago, USA.

05/2019 **Quantifying the magic of quantum channels**. Department of Physics and Astronomy, Louisiana State University, USA.

12/2018	**Semidefinite optimization for quantum information**. Center for Computation and Technology, Louisiana State University, USA.
12/2018	**Quantification and manipulation of quantum coherence**. Department of Physics and Astronomy, Louisiana State University, USA.
06/2018	**Quantum state redistribution with and without communication**. Rocky Mountain Summit on Quantum Info, University of Colorado, Boulder, USA.
01/2018	**Asymptotic entanglement manipulation under PPT operations**. Maths Seminar, University of Nottingham, UK.
01/2018	**Semidefinite optimization for quantum information processing**. GAMP/QMATH Lecture, University of Copenhagen, Denmark.
11/2017	**Evaluating communication capabilities of quantum channels**. QCQIP 2017, AMSS, Chinese Academy of Sciences, Beijing, China.
07/2017	**Semidefinite programming strong converse bounds for channel capacities**. Beyond i.i.d. in Information Theory Workshop, NUS, Singapore.
06/2017	**Strong converse bounds for communication over quantum channels**. Quantum Information Seminar, SUSTech, Shenzhen, China.
12/2015	**Activated zero-error classical communication of quantum channels**. Sydney Quantum Information Theory Workshop, UTS, Sydney, Australia.

PROFESSIONAL SERVICE

Editor	Quantum.
Program Committee	23rd Asian Quantum Information Science Conference (AQIS 2023), 21st Asian Quantum Information Science Conference (AQIS 2021), 19th Asian Quantum Information Science Conference (AQIS 2019), Beyond IID in Information Theory 8 (2020).
Journal Referee	Nature Communications, Physical Review Letters, npj Quantum Information, Quantum, PRX Quantum, Communications in Mathematical Physics, IEEE Transactions on Information Theory, Journal on Selected Areas in Information Theory, Advanced Quantum Technologies, SciPost Physics, Quantum Science and Technology, Physical Review Research, Physical Review A, Acta Mathematica Scientia, IEEE Transactions on Neural Networks and Learning Systems, and Communications Physics.
Conference Referee	Conference on Quantum Information Processing (QIP), NeurIPS, IEEE International Symposium on Information Theory (ISIT), ACM SIGKDD, Asian Quantum Information Science Conference (AQIS), Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC), and IEEE Information Theory Workshop (ITW).
Conference Organization	Coordinator of QIP 2015 (Sydney) and International Workshop on Quantum Computing and Quantum Information Processing 2017 (Beijing).

Advising & Mentorship

Postdoc Researchers	Yin Mo (2023-present), Yu-Ao Chen (2023-present)
PhD students	Mingrui Jing (2023-present) Chengkai Zhu (2023-present) Chenghong Zhu (2023-present) Lei Zhang (2023-present)

Research Assistants	Zhiping Liu, Hongshun Yao, Xia Liu, Keming He, Xian Wu, Kaichu Chen, Erdong Huang, Yu Gan, Tengxiang Lin, Yingjian Liu.
Research Interns	Zhiping Liu (2023/02-2023/05, now PhD student at NJU), Yifei Chen (2023/01-2023/04, graduate student at University of Cambridge), Lei Zhang (2021/12-2023/04, now PhD student at HKUST-GZ), Xia Liu (2021/08-2023/04, PhD at CAS), Haokai Zhang (2021/10-2023/04, PhD at Tsinghua University), Chenghong Zhu (2021/12-2023/04, now PhD student at HKUST-GZ), Mingrui Jing (2022/05-2023/04, now PhD student at HKUST-GZ), Zhan Yu (2021/11-2023/05, now PhD student at NUS), Zhixin Song (2020/04-2021/07, now PhD at Georgia Tech), Xuanqiang Zhao (202008-202208, now PhD at HKU), Benchi Zhao (2020/10-2022/03, now PhD at Osaka), Ranyiliu Chen (2020/08-2021/08, now PhD at Copenhagen), Jiaqing Jiang (2020/07-2021/04, now PhD at Caltech), Chenfeng Cao (2020/07-2020/10, now PhD at HKUST), Sizhuo Yu (2021/01-2021/10, now PhD at Paris-Saclay), Zihan Xia (2021/04-2022/03, now student at USC), Qinghe Wang (2020/09-2021/09, now student at UCLA), Zihe Wang (2020/07-2021/07, now software engineer at Baidu), Yin Mo (2021/09-2021/12, Baidu→HKUST-GZ), Luozhen Li (2022/08-2022/11, now graduate student at TU Delft), Chengkai Zhu (2021/08-2023/04, now PhD student at HKUST-GZ), Geng Liu (2021/08-2023/04, now PhD student at CUHK-SZ), Hongshun Yao (2021/08-2023/04, graduate student), Zhenduo Wang (2022/07-2022/09), Kaiyan Shi (2021/04-2021/07), Ruilin Ye (2021/09-2022/01), Jiaxin Huang (2021/09-2022/01), Jiahui Wang (2021/06-2021/08), Yixuan Song (2021/06-2021/08), Maoran Li (2021/02-2021/07), Yingjian Liu (2021/01-2021/07), Zixian Yan (2020/09-2021/09), Hanzhe Xi (2021/05-2021/09), Yifang Chen (2020/03-2020/06), Zelin Meng (2020/04-2021/07).
Advised visiting students	Guangxi Li (PhD at UTS, visiting student from 202004 to 202303), Youle Wang (PhD at UTS, visiting student 202004 to 202303), supported by the Baidu-UTS AI Meets Quantum project.

Teaching Experience

Spring 2024	INFH 5000 - Information Science and Technology: Essentials and Trends, Information hub, HKUST (Guangzhou).
Spring 2024	AIAA 5072 - Quantum Computing, AI Thrust, HKUST (Guangzhou).
Fall 2023 (2 sessions)	INFH 5000 - Information Science and Technology: Essentials and Trends, Information hub, HKUST (Guangzhou).
11/2022	Theory and Practice of Quantum AI, Baidu Technology Salon, Baidu Inc.
12/2021	Qulearn: an online textbook for applied quantum computing.
11/2020	Introduction to quantum computing, Dandelion Instructional Platform, Baidu Inc.
06/2019	Introduction to quantum computing, Illinois Quantum Computing Summer School, University of Illinois Urbana-Champaign.
11/2018	Introductory lecture on quantum error mitigation, University of Maryland, College Park.

01/2018 GAMP Lecture: Semidefinite optimization for quantum information processing, University of Copenhagen.

PUBLICATIONS

I have 47 papers published in refereed journals, 15 papers published in peer-reviewed conference proceedings and 12 preprint papers. In particular, I published 5 papers in Physical Review Letters (premier journal in physics), 8 papers in IEEE Transactions on Information Theory (premier journal in information theory), 2 papers in npj Quantum Information (premier journal in quantum information), 1 paper in JSAC (premier journal in communication theory), and 5 papers in NeurIPS and AAAI (top-tier conferences in artificial intelligence). My publications are also available on arXiv and Google Scholar.

PEER-REVIEWED JOURNAL ARTICLES

(J47) C. Zhu, C. Zhu, and **X. Wang***, *Estimate distillable entanglement and quantum capacity by squeezing useless entanglement*, IEEE Journal on Selected Areas in Communications (in press, 2024).

(J46) G. Li, X. Zhao, and **X. Wang***, *Quantum Self-Attention Neural Networks for Text Classification*, Science China Information Sciences (in press, 2024).

(J45) Y. Wang, L. Zhang, Z. Yu, and **X. Wang***, *Quantum Phase Processing: Transform and Extract Eigen-Information of Quantum Systems*, Physical Review A (in press).

(J44) K. Wang, Y. A. Chen, and **X. Wang**, *Mitigating Quantum Errors via Truncated Neumann Series*, Science China Information Sciences 66 (8), 180508, 2023.

(J43) R. Chen, B. Zhao, and **X. Wang***, *Near-term Efficient Quantum Algorithms for Entanglement Analysis*, Physical Review Applied 20 (2), 024071, 2023.

(J42) X. Zhao, B. Zhao, Z. Xia, and **X. Wang***, *Information recoverability of noisy quantum states*, Quantum 7, 978, 2023.

(J41) Y. Wang, B. Zhao, and **X. Wang***, *Quantum algorithms for estimating quantum entropies*, Physical Review Applied 19, 044041, 2023.

(J40) Z. Yu, X. Zhao, B. Zhao, and **X. Wang***, *Optimal quantum dataset for learning a unitary transformation*, Physical Review Applied 19, 034017, 2023.

(J39) **X. Wang** and M. M. Wilde, *Exact entanglement cost of quantum states and channels under positive-partial-transpose-preserving operations*, Physical Review A 107, 012429, 2023.

(J38) J. Jiang and **X. Wang***, *Lower bound for the T count via unitary stabilizer nullity*, Physical Review Applied (in press), 2023.

(J37) K. Wang, Z. Song, X. Zhao, Z. Wang, and **X. Wang***, *Detecting and quantifying entanglement on near-term quantum devices*, npj Quantum Information 8, 52, 2022.

(J36) D. Ding, S. Khatri, Y. Quek, P. W. Shor, **X. Wang**, and M. M. Wilde, *Bounding the forward classical capacity of bipartite quantum channels*, in IEEE Transactions on Information Theory (in press), 2022.

(J35) J. Jiang, K. Wang, and **X. Wang***, *Physical Implementability of Linear Maps and Its Application in Error Mitigation*, Quantum 5, 600, 2021.

(J34) X. Zhao, B. Zhao, Z. Wang, Z. Song, and **X. Wang***, *LOCCNet: a machine learning framework for distributed quantum information processing*, npj Quantum Information 7, 159, 2021.

(J33) R. Chen, Z. Song, X. Zhao, and **X. Wang***, *Variational Quantum Algorithms for Trace Distance and Fidelity Estimation*, Quantum Science and Technology 7, 015019, 2021.

(J32) Y. Wang, G. Li, and **X. Wang***, *Variational quantum Gibbs state preparation with a truncated Taylor series*, Physical Review Applied 16, 054035, 2021.

(J31) Y. Wang, G. Li, and **X. Wang***, *A Hybrid Quantum-Classical Hamiltonian Learning Algorithm*, SCIENCE CHINA Information Sciences 66(2), 129502, 2023.

(J30) **X. Wang**, Z. Song, and Y. Wang, *Variational Quantum Singular Value Decomposition*, Quantum 5, 483, 2021.

(J29) **X. Wang**, *Pursuing the fundamental limits for quantum communication*, IEEE Transactions on Information Theory 67(7), 4524-4532, 2021.

(J28) R. Salzmann, N. Datta, G. Gour, **X. Wang**, and M. M. Wilde, *Symmetric distinguishability as a quantum resource*, New Journal of Physics 23 083016, 2021.

(J27) R. Chen, B. Zhao, Z. Song, X. Zhao, K. Wang, and **X. Wang***, *Hybrid quantum-classical algorithms: Foundation, design and applications*, Acta Phys. Sin. 70(21): 210302, 2021.

(J26) C. Cao and **X. Wang***, *Noise-assisted Quantum Autoencoder*, Physical Review Applied 15, 054012, 2021.

(J25) **X. Wang** and M. M. Wilde, *Cost of quantum entanglement simplified*, Physical Review Letters 125, 040502, 2020, **(Contributed talk at QIP 2019)**.

(J24) **X. Wang**, M. M. Wilde, and Y. Su, *Efficiently computable bounds for magic state distillation*, Physical Review Letters 124, 090505, 2020.

(J23) **X. Wang** and M. M. Wilde, α-*Logarithmic negativity*, Physical Review A 102, 032416, 2020.

(J22) P. Rebentrost, Y. Hamoudi, M. Ray, **X. Wang**, S. Yang, and M. Santha, *Quantum algorithms for hedging and the sparsitron*, Physical Review A 103, 012418, 2020.

(J21) **X. Wang**, M. M. Wilde, and Y. Su, *Quantifying the magic of quantum channels*, New Journal of Physics 21, 103002, 2019, **(Contributed talk at QIP 2020)**.

(J20) **X. Wang** and M. M. Wilde, *Resource theory of asymmetric distinguishability*, Physical Review Research 1, 033170, 2019, **(Contributed talk at QIP 2020)**.

(J19) D. W. Berry, A. M. Childs, Y. Su, **X. Wang**, and N. Wiebe, *Time-dependent Hamiltonian simulation with L^1-norm scaling*, Quantum 4, 254, 2020.

(J18) K. Fang, **X. Wang**, M. Tomamichel, and M. Berta, *Quantum Channel Simulation and the Channel's Smooth Max-Information*, in IEEE Transactions on Information Theory 66(4): 2129-2140, 2020.

(J17) **X. Wang**, K. Fang, and M. Tomamichel, *On converse bounds for classical communication over quantum channels*, IEEE Transactions on Information Theory 65(7): 4609-4619, 2019, **(Contributed talk at QIP 2018)**.

(J16) **X. Wang**, K. Fang, and R. Duan, *Semidefinite programming converse bounds for quantum communication*, IEEE Transactions on Information Theory 65(4): 2583-2592, 2019, **(Contributed talk QIP 2018)**.

(J15) **X. Wang** and M. M. Wilde, *Resource theory of asymmetric distinguishability for quantum channels*, Physical Review Research 1, 033169, 2019.

(J14) K. Fang, **X. Wang**, M. Tomamichel, and R. Duan, *Non-asymptotic entanglement distillation*, IEEE Transactions on Information Theory 65(10): 6454-6465, 2019.

(J13) B. Regula, K. Fang, **X. Wang**, and M. Gu, *One-shot entanglement distillation beyond LOCC*, New Journal of Physics 21, 103017, 2019.

(J12) **X. Wang**, W. Xie, and R. Duan, *Semidefinite programming strong converse bounds for classical capacity*, IEEE Transactions on Information Theory 64(1): 640-653, 2018, **(Contributed talk QIP 2017)**.

(J11) K. Fang, **X. Wang**, L. Lami, B. Regula, and G. Adesso, *Probabilistic distillation of quantum coherence*, Physical Review Letters 121, 070404, 2018.

(J10) **X. Wang** and R. Duan, *Separation between quantum Lovász number and entanglement-assisted zero-error classical capacity*, IEEE Transactions on Information Theory 64(3): 1454-1460, 2018.

(J9) B. Regula, K. Fang, **X. Wang**, and G. Adesso, *One-shot coherence distillation*, Physical Review Letters 121, 010401, 2018.

(J8) Y. Li, Y. Qiao, **X. Wang**, and R. Duan, *Tripartite-to-bipartite Entanglement Transformation by Stochastic Local Operations and Classical Communication and the Classification of Matrix Spaces*, Communications in Mathematical Physics 358(2): 791-814, 2018.

(J7) L. Lami, B. Regula, **X. Wang**, R. Nichols, A. Winter, and G. Adesso, *Gaussian quantum resource theories*, Physical Review A 98, 022335 (**Editors' Suggestion**), 2018.

(J6) M. G. Díaz, K. Fang, **X. Wang**, M. Rosati, M. Skotiniotis, J. Calsamiglia, A. Winter, *Using and reusing coherence to realize quantum processes*, Quantum 2, 100, 2018.

(J5) **X. Wang** and R. Duan, *Irreversibility of Asymptotic Entanglement Manipulation Under Quantum Operations Completely Preserving Positivity of Partial Transpose*, Physical Review Letters 119, 180506, 2017 **(Contributed talk QIP 2017).**

(J4) **X. Wang** and R. Duan, *Nonadditivity of Rains bound for distillable entanglement*, Physical Review A 95, 062322, 2017.

(J3) Y. Li, **X. Wang**, R. Duan, *Indistinguishability of bipartite states by positive-partial-transpose operations in the many-copy scenario*, Physical Review A 95, 052346, 2017.

(J2) W. Xie, K. Fang, **X. Wang**, and R. Duan, *Approximate broadcasting of quantum correlations*, Physical Review A 96, 022302, 2017.

(J1) **X. Wang** and R. Duan, *Improved semidefinite programming upper bound on distillable entanglement*, Physical Review A 94, 050301 (Rapid Communication), 2016.

PEER-REVIEWED CONFERENCE PROCEEDINGS

(C15) H. Zhang, C. Zhu, G. Liu, and **X. Wang***, *Exponential Hardness of Optimization from the Locality in Quantum Neural Networks*, Thirty-Eighth AAAI Conference on Artificial Intelligence (AAAI 2024).

(C14) H. Zhang, C. Zhu, M. Jing, and **X. Wang***, *Statistical Analysis of Quantum State Learning Process in Quantum Neural Networks*, Advances in Neural Information Processing Systems 36 (NeurIPS 2023).

(C13) L. Lami, B. Regula, **X. Wang**, and M. Wilde, *Upper bounds on the distillable randomness of bipartite quantum states*, 2023 IEEE Information Theory Workshop (ITW).

(C12) Z. Yu, H. Yao, M. Li, and **X. Wang***, *Power and limitations of single-qubit native quantum neural networks*, Advances in Neural Information Processing Systems 35 (NeurIPS 2022).

(C11) G. Li, R. Ye, X. Zhao, and **X. Wang***, *Concentration of Data Encoding in Parameterized Quantum Circuits*, Advances in Neural Information Processing Systems 35 (NeurIPS 2022).

(C10) G. Li, Z. Song, and **X. Wang***, *VSQL: Variational Shadow Quantum Learning for Classification*, in Proceedings of the Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI 2021).

(C9) D. Ding, S. Khatri, Y. Quek, P. W. Shor, **X. Wang**, and M. M. Wilde, *Upper bound on the classical capacity of a quantum channel assisted by classical feedback*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT 2021).

(C8) K. Wang, **X. Wang**, and M. Wilde, *Quantification of Unextendible Entanglement and Its Applications in Entanglement Distillation*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT 2020).

(C7) **X. Wang**, K. Fang, and M. Tomamichel, *On finite blocklength converse bounds for classical communication over quantum channels*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT 2018).

(C6) S. Liu, **X. Wang**, L. Zhou, J. Guan, Y. Li, Y. He, R. Duan, and M. Ying, $Q|SI\rangle$: *A Quantum Programming Environment*, in Symposium on Real-Time and Hybrid Systems. Lecture Notes in Computer Science, vol 11180 (2018).

(C5) K. Fang, **X. Wang**, M. Tomamichel, and M. Berta, *Quantum Channel Simulation and the Channel's Smooth Max-Information*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT 2018).

(C4) W. Xie, **X. Wang**, and R. Duan, *Converse bounds for classical communication over quantum broadcast channels and quantum multi-access channels*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT 2018).

(C3) **X. Wang**, W. Xie, and R. Duan, *Semidefinite programming converse bounds for classical communication over quantum channels*, Proceedings of the IEEE International Symposium on Information Theory (ISIT 2017).

(C2) **X. Wang** and R. Duan, *A semidefinite programming upper bound of quantum capacity*, Proceedings of IEEE International Symposium on Information Theory (ISIT 2016).

(C1) **X. Wang** and Runyao Duan, *On the quantum no-signalling assisted zero-error simulation cost of non-commutative bipartite graphs*, Proceedings of the IEEE International Symposium on Information Theory (ISIT 2016).

PREPRINTS

(P18) **X. Wang**, Y. Chen, L. Zhang, and C. Zhu, *Reversible Entanglement Beyond Quantum Operations*, arXiv:2312.04456.

(P17) Y. Chen, C. Zhu, K. He, M. Jing, and **X. Wang***, *Virtual Quantum Markov Chains*, arXiv:2312.02031.

(P16) Y. Mo, C. Zhu, Z. Liu, M. Jing, and **X. Wang***, *Enhancement of non-Stabilizerness within Indefinite Causal Order*, arXiv:2311.15494.

(P15) **X. Wang**, M. Jing, and C. Zhu, *Computable and Faithful Lower Bound for Entanglement Cost*, arXiv:2311.10649.

(P14) H. Yao, X. Liu, C. Zhu, and **X. Wang***, *Optimal uni-local virtual quantum broadcasting*, arXiv:2310.15156.

(P13) C. Zhu, Z. Liu, C. Zhu, and **X. Wang***, *Limitations of Classically-Simulable Measurements for Quantum State Discrimination*, arXiv:2310.11323.

(P12) M. Jing, G. Liu, H. Ren, and **X. Wang***, *Quantum sequential scattering model for quantum state learning*, arXiv:2310.07797.

(P11) Z. Yu, Q. Chen, Y. Jiao, Y. Li, X. Lu, **X. Wang**, Z. Yang, *Provable Advantage of Parameterized Quantum Circuit in Function Approximation*, arXiv:2310.07528.

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PATENTS

During my work in industry, I developed technologies and made innovations to overcome science and engineering difficulties in quantum information processing, quantum circuit design, quantum machine learning, and quantum control. I have 40 granted patents and more than 40 patents under review. A selected list of my granted patents is as follows.

(G1) **X. Wang**, X. Zhao, B. Zhao, Entangled quantum state purification method, device, equipment, storage medium, and product, CN112529200, Granted, 2021.

(G2) **X. Wang**, R. Duan, Quantum data storage method, reading method, device and computing device, CN111563186, Granted, 2021

(G3) **X. Wang**, X. Zhao, Simulation method, computing device, classical device, storage device, and product, CN112561068, Granted, 2021.

(G4) **X. Wang**, R. Chen, X. Zhao, Z. Song, Method and device for determining distance between quantum data, CN112633510, Granted, 2021.

(G5) **X. Wang**, G. Li, X. Zhao, Model training method and device, electronic equipment and media, CN113792881, Granted, 2022.

(G6) **X. Wang**, K. Wang, X. Zhao, Method and device for eliminating quantum noise, electronic equipment and medium, CN112990472B, Granted, 2022

(G7) **X. Wang**, J. Jiang, X. Zhao, Z. Song, Quantum circuit processing method, device, equipment, storage medium, and product, CN112668722, Granted, 2021.

(G8) **X. Wang**, S. Yu, Z. Song, X. Zhao, Quantum neural network training method and device, electronic equipment and medium, CN113033703, Granted, 2021

(G9) **X. Wang**, X. Zhao, Z. Song, Quantum entangled state assignment method, device, equipment, storage medium and product, CN112529202, Granted, 2021

(G10) **X. Wang**, L. Jin, Y. Song, Z. Meng, Control method and device of quantum hardware, CN113890513, Granted, 2022