

# Yudong Cao

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Experienced technology leader with a decade of expertise at the intersection of quantum computing, artificial intelligence, and advanced R&D. Proven track record of bridging deep technical knowledge with strategic insight to develop groundbreaking solutions and drive innovation across industries such as national security, aerospace, and pharmaceuticals. Recognized for delivering impactful prototypes, fostering cross-disciplinary collaboration, and contributing to thought leadership through well-cited publications and patents [As of December 2024, in total 30 patents (16 granted, 9 pending, 5 abandoned)]. Passionate about advancing emerging technologies and translating them into actionable strategies that deliver measurable business value.

## Experience

- (June 2019 - December 2024) **Chief Technology Officer, Zapata AI.**
  - Led cross-disciplinary teams to develop beyond-state-of-the-art classical computing methods, including advanced optimization and machine learning techniques.
  - Established collaborations with government agencies, academia, and industry partners to align quantum research with high-impact applications in aerospace and national security.
  - Secured funding for quantum research initiatives, combining technical expertise with strategic proposal development.
  - Developed and implemented quantum and hybrid algorithms for optimization, machine learning, and financial problems, addressing real-world challenges in different industries.
  - Published peer-reviewed articles in quantum algorithms, complexity theory, and quantum-inspired computation, contributing to the scientific community and industry standards.
  - Received *Boston Business Journal 40 Under 40* award for my role in technology leadership.
- (September 2016 - July 2018) **Postdoctoral researcher, Harvard University.**

Worked in Department of Chemistry and Chemical Biology with Alán Aspuru-Guzik on quantum algorithms for quantum chemistry and machine learning.
- (September 2012 - August 2016) **Research assistant, Purdue University.**

Doctoral advisor: Sabre Kais. Thesis work focusing on quantum complexity theory, adiabatic quantum computing and perturbation theory. Dissertation received 2016 *Chorafas Award* in Informatics and Computer Science.
- (September 2013 - May 2015) **Teaching assistant, Purdue University.**

Taught both undergraduate and graduate level courses in the Department of Computer Science. See “Teaching”.

## Education

- Executive education, Wharton CTO program, University of Pennsylvania, 2022
- Ph.D., Purdue University, Computer Science, 2016
- M.S., Purdue University, Computer Science, 2015
- M.S., Purdue University, Mechanical Engineering, 2013
- B.S., Purdue University, Mechanical Engineering, 2011
- B.S., Shanghai Jiaotong University, Mechanical Engineering, 2011

## Publications

1. John Penuel, Amara Katabarwa, Peter D. Johnson, Collin Farquhar, Yudong Cao, Michael C. Garrett. **Feasibility of accelerating incompressible computational fluid dynamics simulations with fault-tolerant quantum computers**. 2024. arXiv:2406.06323 [quant-ph]
2. Nicole Bellonzi, Alexander Kunitsa, Joshua T. Cantin, Jorge A. Campos-Gonzalez-Angulo, Maxwell D. Radin, Yanbing Zhou, Peter D. Johnson, Luis A. Martínez-Martínez, Mohammad Reza Jangrouei, Aritra Sankar Brahmachari, Linjun Wang, Smik Patel, Monika Kodrycka, Ignacio Loaiza, Robert A. Lang, Alán Aspuru-Guzik, Artur F. Izmaylov, Jhonathan Romero Fontalvo, and Yudong Cao. **Feasibility of accelerating homogeneous catalyst discovery with fault-tolerant quantum computers**. 2024. arXiv:2406.06335 [quant-ph]
3. Mohammad Ghazi Vakili, Christoph Gorgulla, AkshatKumar Nigam, Dmitry Bezrukov, Daniel Varoli, Alex Aliper, Daniil Polykovsky, Krishna M Padmanabha Das, Jamie Snider, Anna Lyakisheva, Ardalan Hosseini Mansob, Zhong Yao, Lela Bitar, Eugene Radchenko, Xiao Ding, Jinxin Liu, Fanye Meng, Feng Ren, Yudong Cao, Igor Stagljär, Alán Aspuru-Guzik, Alex Zhavoronkov. **Quantum Computing-Enhanced Algorithm Unveils Novel Inhibitors for KRAS**. *Nature Biotechnology*. 2024. arXiv:2402.08210 [quant-ph]
4. Amara Katabarwa, Collin Farquhar, Hyeonrak Choi, Marc Davis, Dirk Englund, Yudong Cao. **Reinforcement Learning for Gate Synthesis in Noisy Quantum Systems**. 2023 *IEEE International Conference on Quantum Computing and Engineering (QCE)*. doi:10.1109/QCE57702.2023.10216
5. Po-Yu Kao, Ya-Chu Yang, Wei-Yin Chiang, Jen-Yueh Hsiao, Yudong Cao, Alex Aliper, Feng Ren, Alán Aspuru-Guzik, Alex Zhavoronkov, Min-Hsiu Hsieh, Yen-Chu Lin. **Exploring the advantages of quantum generative adversarial networks in Generative Chemistry**. *Journal of Chemical Information and Modeling*. 2023.
6. William P Banner, Shima Bab Hadiashar, Grzegorz Mazur, Tim Menke, Marcin Ziolkowski, Ken Kennedy, Jhonathan Romero, Yudong Cao, Jeffrey A. Grover, William D. Oliver. **Quantum Inspired Optimization for Industrial Scale Problems**. 2023. arXiv:2305.02179.
7. Dax Enshan Koh, Guoming Wang, Peter D. Johnson, Yudong Cao. **Foundations for Bayesian inference with engineered likelihood functions for robust amplitude estimation**. *Journal of Mathematical Physics*: 63(5). 2022.
8. Javier Alcazar, Andrea Cadarso, Amara Katabarwa, Marta Mauri, Borja Peropadre, Guoming Wang, Yudong Cao. **Quantum algorithm for credit valuation adjustments**. 2021. arXiv:2105.12087 [quant-ph].
9. Si Yue Guo, Pascal Friederich, Yudong Cao, Tony Wu, Christopher Forman, Douglas Mendoza, Matthias Degroote, Andrew Cavell, Veronica Krasecki, Riley Hickman, Abhishek Sharma, Leroy Cronin, Nathan Gianeschi, Randall Goldsmith, Alán Aspuru-Guzik. **A molecular computing approach to solving optimization problems via programmable microdroplet arrays**. *Matter*. Volume 4, Issue 4, pp. 1107-1124. 2021. doi.org/10.26434/chemrxiv.10250897.v1.
10. Amir H. Karamlou, William A. Simon, Amara Katabarwa, Travis L. Scholten, Borja Peropadre, Yudong Cao. **Analyzing the Performance of Variational Quantum Factoring on a Superconducting Quantum Processor**. 2021. Accepted in *npj Quantum Information*. arXiv:2012.07825 [quant-ph].
11. Guoming Wang, Dax Enshan Koh, Peter D. Johnson, Yudong Cao. **Minimizing estimation runtime on noisy quantum computers**. *PRX Quantum*. 2021. In press. arXiv:2006.09350v3 [quant-ph].
12. Dax Enshan Koh, Guoming Wang, Peter D. Johnson, Yudong Cao. **A framework for engineering quantum likelihood functions for expectation estimation**. 2020. arXiv:2006.09349 [quant-ph].
13. Pierre-Luc Dallaire-Demers, Michał Stęchły, Jerome F. Gonthier, Ntwali Toussaint Bashige, Jonathan Romero, Yudong Cao. **An application benchmark for fermionic quantum simulations**. 2020. arXiv:2003.01862 [quant-ph].
14. Yudong Cao, Jonathan Romero, Jonathan P. Olson, Matthias Degroote, Peter D. Johnson, Mária Kieferová, Ian D. Kivlichan, Tim Menke, Borja Peropadre, Nicolas P. D. Sawaya, Sukin Sim, Libor Veis, Alán Aspuru-Guzik. **Quantum Chemistry in the Age of Quantum Computing**. 2019. *Chemical Reviews*. In press. arXiv:1812.09976 [quant-ph].
15. Eric R. Anschuetz, Yudong Cao. **Realizing Quantum Boltzmann Machines Through Eigenstate Thermalization**. MIT-CTP/5106. 2019. arXiv:1903.01359 [quant-ph].

16. Eric R. Anschuetz, Jonathan P. Olson, Alán Aspuru-Guzik, Yudong Cao. **Variational quantum factoring**. In: Feld S., Linnhoff-Popien C. (eds) *Quantum Technology and Optimization Problems (QTOP 2019), Lecture Notes in Computer Science*, vol 11413. Springer, Cham. arXiv:1808.08927 [quant-ph].
17. Yudong Cao, Jhonathan Romero, Alán Aspuru-Guzik. **Potential of quantum computing for drug discovery**. *IBM Journal of Research and Development*. Volume: 62, Issue: 6, Nov.-Dec. 1, 2018.
18. Sukin Sim, Yudong Cao, Jonathan Romero, Peter D. Johnson, Alan Aspuru-Guzik. **A framework for algorithm deployment on cloud-based quantum computers**. 2018. arXiv:1810.10576 [quant-ph].
19. E. Schuyler Fried, Nicolas P. D. Sawaya, Yudong Cao, Ian D. Kivlichan, Jhonathan Romero, Alán Aspuru-Guzik. **qTorch: The Quantum Tensor Contraction Handler**. *PLoS ONE* 13(12): e0208510. 2018. arXiv:1709.03636 [quant-ph].
20. Yudong Cao, Gian Giacomo Guerreschi, Alán Aspuru-Guzik. **Quantum Neuron: An elementary building block for machine learning on a quantum computer**. 2017. arXiv:1711.11240 [quant-ph].
21. Peter D. Johnson, Jonathan P. Olson, Jhonathan Romero, Yudong Cao, Alán Aspuru-Guzik. **QVEctor: an algorithm for device-tailored quantum error correction**. 2017. arXiv:1711.02249 [quant-ph].
22. Jarrod McClean, Nicholas Rubin, Kevin Sung, Ian David Kivlichan, Xavier Bonet-Monroig, Yudong Cao, Chengyu Dai, Eric Schuyler Fried, Craig Gidney, Brendan Gimby, Pranav Gokhale, Thomas Haner, Tarini Hardikar, Vojtěch Havlíček, Oscar Higgott, Cupjin Huang, Josh Izaac, Zhang Jiang, Xinle Liu, Sam McArdle, Matthew Neeley, Thomas O'Brien, Bryan O'Gorman, Isil Ozfidan, Maxwell D Radin, Jonathan Romero, Nicolas PD Sawaya, Bruno Senjean, Kanav Setia, Sukin Sim, Damian S Steiger, Mark Steudtner, Qiming Sun, Wei Sun, Daochen Wang, Fang Zhang, Ryan Babbush. **OpenFermion: The Electronic Structure Package for Quantum Computers**, *Quantum Science and Technology*, 2020. arXiv:1710.07629 [quant-ph].
23. Jonathan Olson, Yudong Cao, Jonathan Romero, Peter Johnson, Pierre-Luc Dallaire-Demers, Nicolas Sawaya, Prineha Narang, Ian Kivlichan, Michael Wasielewski, Alán Aspuru-Guzik. **Quantum Information and Computation for Chemistry**. *Report for NSF Workshop on Quantum Information and Computation for Chemistry*, 2017. arXiv:1706.05413 [quant-ph].
24. Youhan Fang, Yudong Cao, Robert Skeel. **Quasi-reliable estimate of effective sample size**. 2017. arXiv:1705.03831 [stat.CO].
25. Yudong Cao, Sabre Kais. **Efficient optimization of perturbative gadgets**. *Quantum Information and Computation*, Vol.17, No. 9 & 10, pp. 0779-0809, 2017. arXiv:1709.02705 [quant-ph].
26. Zizhao Zhao, Yudong Cao, R. Edwin García. **Kinetically stabilized metastable polarization states in ferroelectric ceramics**. *Journal of the European Ceramic Society*, Vol. 37, Issue 2, 573-581, 2017.
27. Yudong Cao, Shuxian Jiang, Debbie Perouli, Sabre Kais. **Solving Set Cover with Pairs with quantum annealing**. *Scientific Reports*. 6:33957, 2016. arXiv:1608.08547 [quant-ph].
28. Yudong Cao, Sabre Kais. **Efficient estimation of perturbative error with cellular automata**. 2016. arXiv:1607.01374v1 [quant-ph].
29. Qi Wei, Yudong Cao, Sabre Kais, Bretislav Friedrich, Dudley Herschbach. **Quantum computation using arrays of  $N$  polar molecules in pendular states**. *ChemPhysChem*, doi:10.1002/cphc.201600781, 2016. arXiv:1607.04959 [quant-ph].
30. Yudong Cao, Daniel Nagaj. **Perturbative gadgets without strong interactions**. *Quantum Information and Computation*, Vol. 15, No. 13 & 14, pp. 1197-1222, 2015. arXiv:1408.5881 [quant-ph].
31. Yudong Cao, Ryan Babbush, Jacob Biamonte, Sabre Kais. **Hamiltonian gadgets with improved resource requirements**. *Physical Review A*. Vol. 91, Issue 1, 012315, 2015. arXiv:1311.2555v2 [quant-ph].
32. Felipe Herrera, Yudong Cao, Sabre Kais, Birgitta Whaley. **Infrared-dressed entanglement of cold open-shell polar molecules for universal matchgate quantum computing**. *New Journal of Physics*, 16, 075001, 2014. arxiv:1402.0381 [quant-ph].

33. Jian Pan, Yudong Cao, Xiwei Yao, Zhaokai Li, Chenyong Ju, Xinhua Peng, Sabre Kais, Jiangfeng Du. **Experimental realization of quantum algorithm for solving linear systems of equations**. *Physical Review A*. 89, 022313, 2014. arXiv:1302.1946 [quant-ph].
34. Yudong Cao, Anargyros Papageorgiou, Iasonas Petras, Joseph Traub, Sabre Kais. **Quantum algorithm and circuit design solving the Poisson equation**. *New Journal of Physics*, Vol. 15, 013021, 2013. arXiv:1207.2485v2 [quant-ph].
35. Yudong Cao, Anmer Daskin, Steven Frankel, Sabre Kais. **Quantum circuits for solving linear systems of equations**. Invited article. *Molecular Physics: Special issue for Dudley Herschbach*, Vol. 110, Issue 15-16, pp. 1675 - 1680, 2012. arXiv:1110.2232v3 [quant-ph].
36. Yudong Cao, Bintang Yang. **Non-linear modelling of multilayer piezoelectric actuators in non-trivial configurations based on actuator design parameters and piezoelectric material properties**. *Journal of Intelligent Material Systems and Structure*, Vol. 23, Issue 8, pp. 875 - 884, 2012.
37. Bintang Yang, Dehua Yang, Pengyou Xu, Yudong Cao, Zhiqiang Feng, Guang Meng. **Large stroke and nanometer-resolution giant magnetostrictive assembled actuator for driving segmented mirrors in very large astronomical telescopes**. *Sensors and Actuators A: Physical*, Vol. 179, pp. 193 - 203, 2012.
38. Bintang Yang, Qingwei Liu, Ting Zhang, Yudong Cao, Zhiqiang Feng, Guang Meng. **Non-Contact Translation-Rotation Sensor Using Combined Effects of Magnetostriction and Piezoelectricity**. *Sensors*, Vol. 12(10), pp. 13829-13841, 2012.

## Patents

1. Yudong Cao. **Quantum enhanced word embedding for natural language processing**. Application US11966707B2. Granted on 2024-04-23.
2. Yudong Cao, Christopher J. Savoie. **Generating non-classical measurements on devices with parameterized time evolution**. Application US11941484B2. Granted on 2024-03-26.
3. Yudong Cao. **Realizing controlled rotations by a function of input basis state of a quantum computer**. Application US11861457B2. Granted on 2024-1-2.
4. Yudong Cao. **Quantum enhanced learning agent**. Application US20230394344A1. Granted on 2023-12-07.
5. Peter Douglas Johnson, Maxwell D Radin, Jhonathan Romero, Yudong Cao, Amara Katabarwa. **Quantum Computer with Improved Quantum Optimization by Exploiting Marginal Data**. Application US20230289636A1. Published on 2023-09-14. Abandoned.
6. Alán Aspuru-Guzik, Jonathan P. Olson, Jhonathan Romero Fontalvo, Peter D. Johnson, Yudong Cao, Pierre-Luc Dallaire-Demers. **Device-tailored model-free error correction in quantum processors**. Application US11689223B2. Granted on 2023-06-27.
7. Yudong Cao, Peter D Johnson. **Quantum computer with exact compression of quantum states**. Application US11663513B2. Granted on 2023-05-30.
8. Yudong Cao. **Computer System and Method for Solving Pooling Problem as an Unconstrained Binary Optimization**. Application US20230143904A1. Published on 2023-05-11. Pending.
9. Yudong Cao, Jonathan P. Olson. **Quantum computing system and method for time evolution of bipartite Hamiltonians on a lattice**. Application US20230131510A1. Published on 2023-04-27. Pending.
10. Guoming Wang, Enshan Dax Koh, Peter D. Johnson, Yudong Cao, Pierre-Luc Dallaire-Demers. **Hybrid quantum-classical computer for Bayesian inference with engineered likelihood functions for robust amplitude estimation**. Application US11615329B2. Granted on 2023-03-28.
11. Eric R. Anschuetz, Yudong Cao. **Implementation and optimization of quantum Boltzmann machines**. Application US16/662,895. Publication of US20200134502A1 on 2020-04-30. Granted on 2023-03-14.
12. Yudong Cao, **Computer Architecture for Executing Quantum Programs**. Application US17/011,324. Granted on 2023-03-07.

13. Yudong Cao. **Application benchmark using empirical hardness models**. Application US20230023121A1. Published on 2023-01-26. Pending.
14. Yudong Cao, Andrew Kniazev. **Quantum-Classical System and Method for Matrix Computations**. U.S. Provisional Application US16/864,998. Granted on 2022-12-27.
15. Alán Aspuru-Guzik, Si Yue Guo, Tony Chang-Chi Wu, Pascal Thomas Friederich, Randall Howard Goldsmith, Leroy Cronin, Abhishek Sharma, Yudong Cao, Nathan C Gianneschi, Christopher James Forman. **Molecular computing methods and systems for solving computational problems**. Application US20220389414A1. Published on 2022-12-08. Pending.
16. Eric R. Anschuetz, Yudong Cao, Jonathan Olson. **Hybrid Quantum-Classical Computer System and Method for Performing Function Inversion**. Granted on 2022-11-22.
17. Eric R. Anschuetz, Yudong Cao. **Quantum computer system and method for performing quantum computation with reduced circuit depth**. Application US20220358393A1. Published on 2022-11-10. Pending.
18. Yudong Cao, Andrew Kniazev. **Hybrid Quantum-Classical Computer System and Method for Optimization**. Application US16/844,051. Publication of US20200327441A1 on 2020-10-15. Granted on 2022-11-01.
19. Pierre-Luc Dallaire-Demers, Yudong Cao, Peter D. Johnson. **Quantum algorithm and design for a quantum circuit architecture to simulate interacting fermions**. Application US20220335325A1. Published on 2022-10-20. Pending.
20. Yudong Cao, Jonathan P. Olson. **Hybrid Quantum-Classical Adversarial Generator**. Application US17/174,900. Publication of US20210256351A1 on 2021-08-19. Granted on 2022-10-11.
21. Prineha Narang, Will Thomas Finigan, Michael Cubeddu, Yudong Cao, Thomas Richard Lively. **Qubit allocation for noisy intermediate-scale quantum computers**. Application US11455564B2. Granted on 2022-09-27.
22. Yudong Cao, Eric Reuthe, Jonathan P. Olson. **Dependency-based data routing for distributed computing**. Application US20220283878A1. Published on 2022-09-08. Pending.
23. Pierre-Luc Dallaire-Demers, Yudong Cao, Amara Katabarwa, Jerome Florian Gonthier, Peter D. Johnson. **Computer systems and methods for computing the ground state of a Fermi-Hubbard Hamiltonian**. Application US20210272002A1. Granted on 2021-08-31.
24. Yudong Cao. **Hybrid quantum-classical computer for variational coupled cluster method**. Application US17/272,189. Publication of US20210255856A1 on 2021-08-19. Granted on 2021-11-09.
25. Yudong Cao. **Quantum Computer System and Method for Partial Differential Equation-Constrained Optimization**. Application US17/091,325. Published on 2021-05-06. Pending.
26. Alán Aspuru-Guzik, Yudong Cao, Peter D. Johnson. **Hybrid Quantum-Classical Generative Models for Learning Data Distributions**. Patent Application US17/017,102. Published on 2020-12-31. Abandoned.
27. Yudong Cao. **Discrete Optimization Using Continuous Latent Space**. Application US16/844,011. Published on 2020-10-15. Abandoned.
28. Alán Aspuru-Guzik, Yudong Cao, Peter Johnson, Jonathan Olson, Jhonathan Romero. **Device-tailored model-free error correction in quantum processors**. U.S. Patent Application US16/647,188. Published on 2020-08-27.
29. Yudong Cao, Borja Peropadre, Jonathan P. Olson. **Quantum System and Method for Solving Bayesian Phase Estimation Problems**. Application US16/945,526. Published on 2020-07-31. Abandoned.
30. Yudong Cao. **Hybrid Quantum-Classical Computer for Solving Linear Systems**. Application US16/591,239. Publication of US20200104740A1 on 2020-04-02. Pending.
31. Peter D. Johnson, Max Radin, Jhonathan Romero, Yudong Cao, Amara Katabarwa. **Quantum computer with improved quantum optimization by exploiting marginal data**. Serial No. PCT/US2019/046895. Filed on 08/16/2019. Abandoned.

## Grant funding track record

1. Co-PI. DARPA Quantum Benchmarking program, technical area (TA) 1: hardware agnostic application benchmark. Total: approximately \$3,700,000. Duration: 3 years.
2. Industry partner. NSERC Quantum Alliance. Alliance grants program (ALLRP) – Alliance Quantum grants – Project entitled "Fault tolerant Quantum computing algorithms for chemistry", with Zapata Canada. Total: \$624,000 CAD. Project duration: 5 years.

## Conferences and other speaking engagements

1. Invited panelist. Fireside chat. January 22nd, 2025. The Engine. Cambridge, MA. Host: Jaye Goldstein.
2. Podcast guest. "The Current Reality of Quantum Computing". 632nm Podcast. January 13th, 2025. Host: Mikhail Shalaginov. Cambridge, MA.
3. Keynote speaker. "Small AI, Big Impact: Unlocking the Promise of AI with the Power of Small Models". Chief AI Officer (CAIO) summit. October 2nd, 2024. Washington DC.
4. Senate Briefing. Quantum Industry Coalition. "Issues Facing Quantum Startups". September 12th, 2024. Washington DC.
5. Fireside Chat. With Aaron Pressman, Boston Globe. Qubits Conference. June 17th, 2024. Boston, MA.
6. Invited presenter. "Perspectives on quantum computing's impact on security". MIT NextGen Workshop: Navigating New Threats. May 16th, 2024. Boston, MA.
7. Invited speaker. "Zapata AI application on Chemistry". Digital Science and Applied Science group. BP p.l.c. May 15th, 2024. Host: Shangjie Guo.
8. Invited speaker. "Exploring AI and Quantum Computing in Accelerating Drug Discovery for Cancer Therapies". Bio-IT World Conference and Expo. April 15th, 2024. Boston, MA.
9. Invited speaker. "Enterprise Software for Industrial Generative AI". 2024 Decoding Tomorrow: The Future of Intelligent Enterprise The Role of AI and Startups in the Evolution of Economy and Society. January 30th, 2024. Politecnico di Milano. Milan, Italy.
10. Invited speaker. "Enterprise Software for Industrial Generative AI". 2023 MIT Digital Technology and Strategy Conference. October 25th, 2023. Cambridge, MA.
11. Invited panelist. MIT Executive Education session for Bank of America. MIT Campus E62 - Exec Ed Suite. October 12th, 2023. Cambridge, MA.
12. Invited panelist. MIT Sloan School of Management / Bank of America. E62 / 100 Main St. Executive Education Suite first floor. August 2nd, 2023. Cambridge, MA.
13. Invited panelist. MIT Technology Review Future Compute. April 30th, 2024. 50 Vassar St - Rooms 36-462 and 36-428. MIT. Cambridge, MA.
14. Plenary speaker. Quantum.Tech 2023. Marriott Copley Place. April 26, 2023. Boston, MA.
15. Guest speaker. Harvard Quantum Computing Association. Richard A. and Susan F. Smith Campus Center. Cambridge, MA. April 24th, 2024. Host: Emma Yang.
16. Invited talk. "A51.00001: Building a business at the cutting edge of science". APS March meeting. (A51) Physics Outside The Lab: Government, Policy and Diplomacy, Outreach, Journalism and Entrepreneurship. March 6th, 2023.
17. Guest lecturer. MIT Sloan School of Management. March 1st, 2023. Host: Jonathan Ruane and Will Oliver.
18. Invited speaker. "Quantum and Quantum-Inspired Generative AI and Application". Brown Bag Series. Internal talk at Metron Inc. February 3rd, 2023. Host: Aaron Wagner.
19. Guest lecturer. MIT 6.S094. January 19th, 2023. Host: Sophia Yuqin Duan.

20. Speaker. "Near-Term Applications of Quantum Computing in Health & Pharma". [QuApps 2022](#). December 7th, 2022.
21. Panelist. Panel 2: Advances Have Real Impact: Industry Use Cases | 1:00-2:00pm. [The Convergence: The Promise and Reality of AI and Quantum conference](#). November 14th, 2022. MIT's Kresge Little Theater.
22. Organizer. Alexander McCaskey, Will Zeng, Sarah Kaiser, Yudong Cao and Bettina Heim, [WKS12 — Progress and Challenges in Quantum Intermediate Representations](#). IEEE Quantum Week. September 22nd, 2022.
23. Invited speaker. QSEC annual research conference (QuARC). Feb 7th, 2022.
24. Speaker. ["The Orchestra Journey: From Science to Production"](#). Q2B conference. December 9th, 2021.
25. Co-organizer. [Wks 20 — Progress and Challenges in Quantum Intermediate Representations](#). QCE21 Workshop. IEEE Quantum Week. October 22nd, 2021.
26. Co-organizer. ["Getting Quantum Computing to Production in the Near-term"](#). QCE21 Panel. IEEE Quantum Week. October 21st, 2021.
27. Invited panelist. [Quantum Industry Day](#). September 23rd, 2021. Simons Institute. Moderator: Will Oliver.
28. Invited panelist. [Quantum Software and Services symposium](#). IEEE World Congress on Services. September 8-9th, 2021.
29. Chair of organizing committee. [First workshop on Practical Intermediate Representation for Quantum \(PIRQ\)](#). Quantum Economic Development Consortium (QED-C). July-Aug, 2021.
30. Invited speaker. ["Industry use cases of quantum computers"](#). Samsung Forum. March 2nd, 2021.
31. Invited panelist. [IBM Quantum Thursday](#). October 29th, 2020.
32. Panel organizer and moderator. ["Towards a practical intermediate representation for quantum computing"](#). [IEEE Quantum week](#). October 14th, 2020.
33. Invited panelist. ["Software for Quantum Applications, Algorithms & Workflows"](#). [IEEE Quantum week](#). October 12th, 2020.
34. Guest lecturer. SystemX/EE310. Stanford University. September 24th, 2020.
35. ["Advances in Algorithms for Near-Term Quantum Computers"](#). Speaker. [IEEE Conference on High Performance Extreme Computing Virtual Conference](#). September 21st, 2020.
36. ["Advancing quantum computing ecosystem"](#). Invited speaker. Industry/University Cooperative Research Center (IUCRC) workshop. Purdue University. June 17th, 2020.
37. ["True potential of quantum computers"](#). Invited speaker. [Zen4Quantum talk series](#). May 22nd, 2020.
38. Invited speaker. [iQuHack 2020](#). Cambridge, MA. February, 2020.
39. Guest lecturer. MIT [6.S089](#). Cambridge, MA. January 29th, 2020.
40. ["Machine learning on near-term quantum computers"](#). Speaker. [Q2B 2019](#). San Jose, CA. December 10-12, 2019.
41. ["Machine learning on near-term quantum computers"](#). Speaker. [The International Conference for High Performance Computing, Networking, Storage, and Analysis \(SC19\)](#). Denver, CO. November 17-22, 2019.
42. Invited panelist. [AI World 2019](#). Boston, MA. October 24th, 2019.
43. ["Simulating strongly correlated systems on near-term quantum computers"](#). Invited ITAMP seminar. Harvard University, Cambridge, MA. September 12th, 2019. Host: Nicole Yunger Halpern.
44. Invited panelist. [Quantum.Tech](#). Boston, MA. September 10-11, 2019.
45. ["Quantum Boltzmann machine using eigenstate thermalization"](#). Invited speaker. [Quantum Machine Learning and Data Analytics Workshop](#). Purdue University, West Lafayette, IN. September 5-6, 2019.

46. "Quantum computing for material science". Invited startup presentation. Applied Materials Quantum Workshop. Santa Clara, CA. August 21-23, 2019.
47. "Quantum machine learning at Zapata". Acceture's Quantum Computing Vendors Series. Invited webinar. August 2nd, 2019.
48. "Training neural networks on a quantum computer". Google TechTalk. New York City, NY. July 31st, 2019.
49. "Challenges and opportunities in quantum computing: pharmaceutical use cases". Invited talk and panel participation. **#113: Artificial Intelligence in Drug Discovery and Development: Emerging Technologies and Applications. DIA 2019 Global Annual Meeting**. San Diego, CA, June 24, 2019.
50. "Quantum machine learning at Zapata". Invited talk. Honeywell Quantum Solutions symposium. Phoenix, AZ, May 23, 2019.
51. "Variational quantum factoring". Invited startup presentation. **IBM Q Summit**. Yorktown Heights, NY, May 9, 2019.
52. Invited startup panelist. **BCIC Spring Venture Summit**. Boston, MA, May 5, 2019.
53. Quantum computing market workshop. **Inside Quantum Technology conference**. Boston, MA. March 19-21, 2019.
54. "**Variational Quantum Factoring**". K42.00004. **American Physical Society (APS) March Meeting**. Boston, MA. March 4-8, 2019.
55. "**Improved Training of Quantum Boltzmann Machines**". E27.00001. **American Physical Society (APS) March Meeting**. Boston, MA. March 4-8, 2019.
56. "**Marginals optimization procedure: algorithmically extending the capability of near-term quantum computers**". C42.00010. **American Physical Society (APS) March Meeting**. Boston, MA. March 4-8, 2019.
57. "**Hybrid quantum-classical algorithm for variational coupled cluster method**". A27.00002. **American Physical Society (APS) March Meeting**. Boston, MA. March 4-8, 2019.
58. "Quantum algorithm for variational coupled cluster method" **Quantum Information Processing (QIP) 2019**. University of Colorado Boulder, USA. January 14-18, 2019.
59. "Variational quantum factoring" **Quantum Information Processing (QIP) 2019**. University of Colorado Boulder, USA. January 14-18, 2019.
60. "Improved training of quantum Boltzmann machines" **Quantum Information Processing (QIP) 2019**. University of Colorado Boulder, USA. January 14-18, 2019.
61. "Exact compression of matrix product states and effective ansatz for quantum autoencoder". **Quantum Techniques in Machine Learning (QTML) 2018**. Durban, South Africa, 12 - 16 November, 2018.
62. "Recent developments in variational quantum algorithms". Invited talk. Stony Brook University, Stony Brook, NY. May 22nd, 2018. **Joint Science Meeting**. Host: Robert Harrison.
63. "Recent developments in variational quantum algorithms". Invited talk. University of Massachusetts, Boston, MA. April 24th, 2018. Host: Adolfo del Campo.
64. "Recent developments in variational quantum algorithms". Invited talk. Osaka City University. Osaka, Japan. March 29th, 2018. **5th International Workshop on Quantum Chemistry/Quantum Chemical Calculations on Quantum Computers (QCC-on-QCs 2018)**. Host: Takeji Takui and Kenji Sugizaki.
65. "Recent developments in variational quantum algorithms". Invited talk. Center for Mathematical Science, Cambridge University. Cambridge, UK. February 15th, 2018. Host: Richard Jozsa.
66. "Recent developments in variational quantum algorithms". Invited talk. Alibaba Group. Hangzhou, Zhejiang province, China. January 8th, 2018. Host: Yaoyun Shi.
67. "Recent developments in variational quantum algorithms". Invited talk. University of Science and Technology of China (USTC). Hefei, Anhui province, China. January 3rd, 2018. Host: Jiangfeng Du.

68. "Quantum Neuron: An elementary building block for machine learning on a quantum computer". Poster. **IBM THINKQ conference on Approximate quantum computing**. Yorktown heights, NY, 6 - 8 December, 2017.
69. "Quantum Neurons". Invited talk. **Quantum Techniques in Machine Learning (QTML) 2017**. Verona, Italy, 6 - 8 November, 2017.
70. "Quantum autoencoders for compressing quantum data". Invited talk. Lawrence Berkeley National Lab. Berkeley, CA, October, 2017.
71. "Quantum computing for quantum chemistry". Invited talk. Army Research Office. Cape Canaveral, FL, June 2017.
72. "Quantum algorithms and complexity for quantum chemistry". Invited talk. Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, February 2016. Host: Alán Aspuru-Guzik.
73. "Solving Set Cover with Pairs with quantum annealing". Poster. **Workshop on quantum control of light and matter**. Purdue University, West Lafayette, IN. October, 2015.
74. "Efficient optimization of perturbative gadgets using cellular automata". Poster. **NIST-UMD Workshop on Quantum Information and Computer Science (QuICS)**. University of Maryland, College Park, MD. October, 2015.
75. "Perturbative reductions for quantum many-body Hamiltonians". Invited talk. **Workshop on Novel Computing Approaches to Quantum Chemistry**. Telluride, CO. July, 2015. Host: James Whitfield and Zoltan Zimboras.
76. "Perturbative gadgets without strong interactions". Poster. **The 18th workshop on Quantum Information Processing (QIP 2015)**. Sydney, Australia. January, 2015.
77. "Quantum circuits for solving linear systems". Invited talk. **Winter School for Quantum Information for Quantum Computing**. Palm Spring, CA. January, 2012. Host: Sabre Kais.

## Teaching

- Numerical linear algebra (CS 514), Spring 2014, Spring 2015, Purdue University
- Data structure and algorithms (CS 251), Fall 2014, Fall 2015, Purdue University
- Algorithm design (CS 580), Fall 2014, Purdue University
- Discrete mathematics (CS 182), Fall 2013, Purdue University

## Honors and Awards

- **Boston Business Journal 40 Under 40**, 2024.
- Chorafas Award in Computer Science and Informatics, 2016.
- Graduate student travel grant, 2014.
- Student Innovator, Purdue office of commercialization, 2012.
- Dean's list, Fall 2009 - Spring 2011.
- National fellowship by Chinese Minister of Education, 2009.
- Honor societies: Pi Tau Sigma (Mechanical Engineering), Tau Beta Pi (Engineering).

## Other professional activities

- Guest editor. "Programming Physical Quantum Systems: Methods, Applications, Languages and Compilers". Frontiers of Physics.
- Journal referee: Nature photonics, Nature communication, Physical Review Letters, Physical Review Applied, Physical Review X, Quantum Information and Computation, Quantum, NPJ Quantum Information.