# Thomson Yen

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August 9, 2025

## Education

**2024–now** **PhD**, *Columbia University*
PhD Candidate at Decision, Risk and Operations division

**2022–2023** **MSc**, *Carnegie Mellon University*, *4.17/4.30*
Master's in Machine Learning
Selected Coursework: Robustness and Adaptivity in Shifting Environments, Deep Reinforcement Learning and Control, Intermediate Statistics

**2017–2021** **HBSc. with High Distinction**, *University of Toronto*, *3.96/4.00*
Specialist in Computer Science, Focus in Artificial Intelligence, Specialist in Physics, Minor in Mathematics
Selected Coursework: Neural Nets and Deep Learning, Natural Language Computing, Introduction to Image Understanding, Uncertainty and Learning

## Experience

**2022–2022** **Software Engineer**, *Winterlight Labs, Toronto*
○ Worked on infrastructure that extracts acoustic and linguistic features in speech to monitor severity of neurodegenerative diseases

**2018–2022** **Research Assistant, Quantum Computing**, *Department of Chemistry, University of Toronto, Toronto*, Supervised by Professor Artur Izmaylov
○ Proposed and investigated multiple quantum computing projects in Python and MATLAB that resulted in 15 publications and a patent collectively cited over 1000 times
○ Presented at 8 conferences with audiences ranging from experts to undergraduate students
○ Co-supervised four undergraduate research assistants, one master candidate, one PhD candidate, and one postdoctoral fellow in quantum computing projects

**2020-2021** **Teaching Assistant**, *Quantum Bootcamp Cohort Project, Creative Destruction Lab*

## Honours

**2020** **University of Toronto Excellence Award**, *University of Toronto*

**2020** **CQIQC Undergraduate Summer Research Studentships**, *Centre for Quantum Information and Quantum Control*

**2019** **Hymie And Roslyn Mida Student Award In Theoretical Physics**, *University of Toronto*
Awarded to the students earning highest mark in Quantum Mechanics I

**2019** **Lawrence And Sharen Ho International Scholarship Iii**, *Victoria College, University of Toronto*

**2019** **2nd place (oral presentation) in Physical, Computational & Theoretical division**, *47th. Southern Ontario Undergraduate Student Chemistry Conference*

**2017** **University Of Toronto Admission Scholarship**, *University Of Toronto*

## Presentation and Posters

- **Measurement Optimization in the Variational Quantum Eigensolver method of quantum computing**, contributed talk at Virtual Symposium on Theoretical and Computational Chemistry in Canada, University of Concordia, 2021
- **Measurement Optimization in the Variational Quantum Eigensolver method**, invited talk at Quantum Machine Learning Journal Club Talks, Centre for Quantum Technologies, 2021
- **The Measurement Problem of Variational Quantum Eigensolver**, contributed talk at Quantum Curiosity Talk Series, UofT Quantum Computing Club of University of Toronto, 2020
- **Cartan sub-algebra approach to efficient measurements**, contributed talk at Quantum Tea, Chemical Physics Theory Group of University of Toronto, 2020
- **Reduction of the number of separately measured terms in the Variational Quantum Eigensolver method**, contributed talk at 103rd Canadian Chemistry Conference and Exhibition, Canadian Society for Chemistry, 2020 (Canceled due to COVID-19)
- **Addressing the measurement problem in Variational Quantum Eigensolver**, poster at 35th Symposium on Chemical Physics, University of Waterloo, 2019
- **Addressing the measurement problem in Variational Quantum Eigensolver**, poster at 8th Toronto Conference on Quantum Information and Quantum Control, Centre for Quantum Information and Quantum Control, 2019
- **Reduction of the number of separately measured terms in the Variational Quantum Eigensolver method**, contributed talk at 47th. Southern Ontario Undergraduate Student Chemistry Conference, University of Toronto Scarborough, 2019

# ▬▬ Articles

Published

1. <u>T. C. Yen</u>, and A. F. Izmaylov. Cartan subalgebra approach to efficient measurements of quantum observables. *PRX Quantum* 2, 040320 (2021).

2. <u>T. C. Yen</u>, V. Verteletskyi, and A. F. Izmaylov. Measuring all compatible operators in one series of single-qubit measurements using unitary transformations. *Journal of Chemical Theory and Computation* 16, 2400–2409 (2020).

3. A. F. Izmaylov, <u>T. C. Yen</u>, R. A. Lang, and V. Verteletskyi. Unitary partitioning approach to the measurement problem in the variational quantum eigensolver method. *Journal of Chemical Theory and Computation* 16, 190–195 (2020).

4. V. Verteletskyi, <u>T. C. Yen</u>, and A. F. Izmaylov. Measurement optimization in the variational quantum eigensolver using a minimum clique cover. *Journal of Chemical Physics* 152, 124114 (2020).

5. <u>T. C. Yen</u>, R. A. Lang, and A. F. Izmaylov. Exact and approximate symmetry projectors for the electronic structure problem on a quantum computer. *Journal of Chemical Physics* 151, 164111 (2019).

6. A. F. Izmaylov, <u>T. C. Yen</u>, and I. G. Ryabinkin. Revising the measurement process in the variational quantum eigensolver: is it possible to reduce the number of separately measured operators? *Chemical Science* 10, 3746–3755 (2019).

7. I. G. Ryabinkin, <u>T. C. Yen</u>, S. N. Genin, and A. F. Izmaylov. Qubit coupled cluster method: a systematic approach to quantum chemistry on a quantum computer. *Journal of Chemical Theory and Computation* 14, 6317–6326 (2018).

8. A. F. Izmaylov, and <u>T. C. Yen</u>. How to define quantum mean-field solvable hamiltonians using lie algebras. *Quantum Science and Technology* 6, 044006 (2021).

9. J. S. Kottmann, S. Alperin-Lea, T. Tamayo-Mendoza, A. Cervera-Lierta, C. Lavigne, T. C. Yen, V. Verteletskyi, P. Schleich, A. Anand, M. Degroote, S. Chaney, M. Kesibi, N. G. Curnow, B. Solo, G. Tsilimigkounakis, C. Zendejas-Morales, A. F. Izmaylov, and A. Aspuru-Guzik. TEQUILA: a platform for rapid development of quantum algorithms. *Quantum Science and Technology* 6, 024009 (2021).

10. A. F. Izmaylov, R. A. Lang, and T. C. Yen. Analytic gradients in variational quantum algorithms: algebraic extensions of the parameter-shift rule to general unitary transformations. *Phys. Rev. A* 104, 062443 (2021).

11. T. C. Yen*, A. Ganeshram*, and A. F. Izmaylov. Deterministic improvements of quantum measurements with grouping of compatible operators, non-local transformations, and covariance estimates. *npj Quantum Information* 9, (2023).

12. S. Choi, T. C. Yen, and A. F. Izmaylov. Improving quantum measurements by introducing "ghost" pauli products. *Journal of Chemical Theory and Computation* 18, 7394–7402 (2022).

13. Z. P. Bansingh, T. C. Yen, P. D. Johnson, and A. F. Izmaylov. Fidelity overhead for nonlocal measurements in variational quantum algorithms. *The Journal of Physical Chemistry A* 126, 7007–7012 (2022).

14. L. A. Martínez-Martínez, T. C. Yen, and A. F. Izmaylov. Assessment of various Hamiltonian partitionings for the electronic structure problem on a quantum computer using the Trotter approximation. *Quantum* 7, 1086 (2023).

15. D. Baby*, S. Garg*, T. C. Yen*, S. Balakrishnan, Z. C. Lipton, and Y.-X. Wang. Online label shift: optimal dynamic regret meets practical algorithms. *Spotlight at Advances in Neural Information Processing Systems (NeurIPS)* (2023).

16. S. Patel, T. C. Yen, and A. F. Izmaylov. Extension of exactly-solvable hamiltonians using symmetries of lie algebras. *The journal of physical chemistry a* 128, 4150–4159 (2024).

17. S. Patel, P. Jayakumar, T. C. Yen, and A. F. Izmaylov. Quantum measurement for quantum chemistry on a quantum computer. *Chemical reviews* ASAP, (2025).

### Submitted

18. D. Mittal, A. Li, T. C. Yen, D. Guetta, and H. Namkoong. *Architectural and inferential inductive biases for exchangeable sequence modeling* 2025.

19. T. C. Yen, A. W. T. Siah, H. Chen, T. Peng, D. Guetta, and H. Namkoong. *Data mixture optimization: a multi-fidelity multi-scale bayesian framework* 2025.

## Patent

20. A. F. Izmaylov, A. Anand, J. S. Kottmann, A. Aspuru-Guzik, R. A. Lang, and T. C. Yen. Operator implementations for quantum computation, United States, 63/222, 546, 2021/07/16.