# Curriculum Vitae: Victor Drouin-Touchette, Ph.D.

Institut Quantique, département de génie électrique et informatique et département de physique, Université de Sherbrooke, 2500, boul. de l'Université, Sherbrooke (Québec) J1K 2R1

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Google Scholar

## Professional Experience

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| *now* 09/2023 | **Research Coordinator** <br> Université de Sherbrooke, Sherbrooke, QC, Canada <br> *Fields of research: analog quantum computing, neutral atoms, applied quantum computing, combinatorial optimization, operations research, simulation of quantum systems, quantum machine learning. I work in the groups of Pr Yves Bérubé-Lauzière and Pr Stefanos Kourtis.* |
| *now* 07/2023 | **Quantum Application Scientist** <br> PASQAL Canada Inc., Sherbrooke, Canada <br> *Part time employment; onboarding and training academics and partners on Pasqal's technology, development of applications for Pasqal's QPU* |
| 08/2023 09/2022 | **Postdoctoral Researcher** <br> Rutgers, The State University of New Jersey, Piscataway, NJ, USA <br> *Topics: simulation of quantum systems, analog and adiabatic quantum computing, quantum and classical Monte-Carlo methods, complex systems. Supervisor: Prof. Ananda Roy* |
| 07/2022 09/2016 | **Research Assistant** <br> Rutgers, The State University of New Jersey, Piscataway, NJ, USA <br> *Topics: coupled XY models, Monte-Carlo methods, Anderson and Kondo impurities, Hund's coupling, unconventional superconductivity. Supervisor: Prof. Piers Coleman* |

## Education

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| 2016 - 2022 | **Ph.D. in Physics** <br> Rutgers, The State University of New Jersey, Piscataway, NJ, USA <br> Dissertation: *"Emergent Quantum and Classical Phases From Competing Interactions"* <br> *Topics: coupled XY models, Monte-Carlo methods, Anderson and Kondo impurities, Hund's coupling, unconventional superconductivity* <br> *Thesis Advisor: Prof. Piers Coleman* |
| 2013 - 2016 | **B.Sc, Mathematics and Physics**   *with honors* <br> Université de Montréal, Montréal, Québec, Canada |

## Publications

Google Scholar: Victor Drouin-Touchette

[9] Ayana Sarkar, Martin Schnee, Roya Radgohar, Mojde Fadaie, Victor Drouin-Touchette, Stefanos Kourtis "Concentration-Free Quantum Kernel Learning in the Rydberg Blockade", arxiv:2508:10819

[8] Joseph Gibson, Victor Drouin-Touchette, Stefanos Kourtis "Quantum Counting in the Rydberg Blockade", arxiv:2506:19298

[7] Pratyankara Narasimhan, Stephan Humeniuk, Ananda Roy, Victor Drouin-Touchette "Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Annealer", *Physical Review B* 110.5 (2024) 054432.

[6] Victor Drouin-Touchette "Emergent quantum and classical phases from competing interactions" School of Graduate Studies Electronic Theses and Dissertations, Rutgers, The State University of New Jersey **(thèse doctorale)**

[5] Victor Drouin-Touchette "The Kosterlitz-Thouless phase transition: an introduction for the intrepid student", arxiv:2207:13748

[4] Victor Drouin-Touchette, Elio J. König, Yashar Komijani, and Piers Coleman, "Interplay of charge and spin fluctuations in a Hund's coupled impurity", *Physical Review Research* **4** L042011 (2022) (Letter)

[3] Victor Drouin-Touchette, Peter P. Orth, Piers Coleman, Premala Chandra, and Tom C. Lubensky, "Emergent Potts Order in a Coupled Hexatic-Nematic XY Model", *Physical Review X* 12 (2022) 011043

[2] Victor Drouin-Touchette, Elio J. König, Yashar Komijani, and Piers Coleman, "Emergent moments in a Hund's impurity", *Physical Review B* 103 (2021) 205147

[1] Xiaoran Liu, Sobhit Singh, Victor Drouin-Touchette, T. Asaba, Jess H. Brewer, Qinghua Zhang, Yanwei Cao, B. Pal, S. Middey, P. S. Anil Kumar, M. Kareev, Lin Gu, D. D. Sarma, P. Shafer, E. Arenholz, J. W. Freeland, Lu Li, David Vanderbilt, and Jak Chakhalian, "Proximate Quantum Spin Liquid on Designer Lattice," Nano Letters 21, no. 5 (2021): 2010-2017

## Honors and Awards

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|---|---|
| 2021 - 2022 | **University & Bevier Dissertation Completion Fellowship** (Rutgers, $25 000) |
| 2021 | **Samuel Marateck Fellowship in Quantum Field Theory** (Rutgers, $12 500) |
| 2018 - 2021 | **Doctoral Research Scholarship** (FRQNT, $56 000) |
| 2018 - 2020 | **T. Daniel Brennan Travel Scholarship** (Physics Department, Rutgers, $6 000) |
| 2019 | **ICAM Travel Award** (950$) |
| 2018 | **School of Graduate Studies Travel Award** (Rutgers, $150) |
| 2018 | **Professional Development Fund Award** (Rutgers, $633) |
| 2016 - 2018 | **Masters Research Scholarship, with supplement** (FRQNT, $33 000) |
| 2017 | **Van Dyke Fund Travel Award** (Physics and Astronomy Department, Rutgers, 500$) |
| 2017 | **ICAM Travel Award** (ICAM, 500$) |
| 2017 | **Professional Development Fund Award** (Rutgers University, $925) |

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| 2016 | **Research Internship Grant** (Okinawa Institute of Science and Technology, \$5 000) |
| 2014 - 2015 | **Dean's Prize List** (Université de Montréal) |
| 2015 | **Undergraduate Student Research Award** (NSERC, \$4 500) |
| 2015 | **Undergraduate Student Research Award** (University of Waterloo, \$4 000) |
| 2014 | **Summer Research Award** (Université de Montréal, \$ 4500) |
| 2013 | **Best Extracurricular Project Award** (CEGEP Bois-de-Boulogne, \$500) |
| 2013 | **Advanded Mathematics Seminar Award** (CEGEP Bois-de-Boulogne, \$666) |

## Invited Talks

*Those marked with a star (∗) are talks pertaining to my research work - others are educational/training/general audience talks.*

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| 10/2025 | "Harnessing Rydberg Dynamics for Quantum Kernel Learning", Quantum Science and Technology Seminar Series, University of Calgary, Calgary, Alberta, Canada ∗ |
| 07/2025 | "Hybrid Column Generation on PASQAL Hardware", "Learn Atomic Quantum Programming" Event at École de Technologie Supérieure (ETS), Montréal, Canada |
| 05/2025 | "Introduction to Analog Quantum Computing using Neutral Atoms", Algolab Summer School, Université de Sherbrooke, Sherbrooke, Québec, Canada |
| 10/2024 | "Hybrid classical-quantum approaches with a quantum MIS sampler for hard combinatorial problems", Workshop on Scientific Applications of Quantum Annealers and Simulators, Telluride Science and Innovation Center, Telluride, Colorado, USA ∗ |
| 09/2024 | "Pulse-level Programming of Neutral Atom Devices using Pulser", Tutorial presented at IEEE Quantum Week 2024, Montréal, Québec, Canada |
| 06/2024 | "Introduction to Analog Quantum Computing using Neutral Atoms", Algolab Summer School, Université de Sherbrooke, Sherbrooke, Québec, Canada |
| 02/2024 | "Simulating Spin Systems Using Programmable Quantum Simulators", Theory of Quantum Matter Seminar, Okinawa Institute of Science and Technology (OIST), Japan (Virtual) ∗ |
| 02/2024 | "Simulating Spin Systems Using Programmable Quantum Simulators", Center for the Physics of Materials, McGill University, Montréal, Canada ∗ |
| 02/2024 | "Graph machine learning using Pasqal's neutral atom quantum computer", QSciTech-Quantum BC- CMC QML workshop, Canada (virtuel) |
| 12/2023 | "Introduction to Optimization using an Analog Quantum Computer", Lunch and Learn Seminar, Optimization and Control Group, Pacific Northwest National Lab, USA (Virtual) |
| 11/2023 | "Projet PASQAL: atomes neutres, algorithmes analogiques et optimization", Portes Ouvertes de l'Algolab, Institut Quantique, Université de Sherbrooke, Québec, Canada |
| 11/2023 | "Analog quantum computing using neutral atoms", INTRIQ Industry Day, Centech, Montréal, Québec, Canada |
| 11/2023 | "Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Compute", Séminaire InfoQ, Université de Sherbrooke, Sherbrooke, Québec, Canada ∗ |

07/2023 "Programming a neutral atom analog quantum computer using Pulser Studio", QSciTech, Université de Sherbrooke, Sherbrooke, Québec, Canada

10/2022 "Transitions de phase, émergence et universalité : un parcours en physique ", journée carrière, Collège Bois-de-Boulogne, Québec, Canada

10/2022 "Emergent Discrete Order in Coupled XY models", Séminaire de Physique de la Matière Condensée, Institut Quantique, Université de Sherbrooke, Québec, Canada

06/2022 "Emergent Potts Order in a Coupled Hexatic-Nematic XY model", Canadian Association of Physics 2022 Congress, McMaster University, Hamilton, Ontario, Canada

01/2022 "Emergent Potts Order in a Coupled XY Model", Condensed Matter Theory Seminar, Boston University, USA (Virtual)

10/2021 "Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states", Physics of Quantum Materials Discussion Group, University of Kent, UK (Virtual)

## Contributed Presentations

### *Talks*

02/2025 " Iterative approach to approximately solve MIS problems in dense graphs on neutral atom quantum computers", ROADEF 2025, Paris, France

10/2024 "Hybrid classical-quantum approaches with a quantum MIS sampler for hard combinatorial problems", INFORMS Annual Meeting, Seattle, WA, USA

06/2023 "Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Computer", Adiabatic Quantum Computing Conference, University of New Mexico, Albuquerque, NM, USA - **AQC 2023 Junior Scientist Fellowship**

03/2023 "Confinement/deconfinement transitions in the Majorana Toric Code", March Meeting of the American Physical Society, Las Vegas, USA

04/2022 "Unconventional states of multiorbital impurities due to Hund's coupling", New Jersey Quantum Matter and Information Forum, Princeton, New Jersey, USA

03/2022 "Self-consistent approach to local pairing in multiorbital superconductors", March Meeting of the American Physical Society, Chicago, USA

06/2021 "Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states" - **Finaliste pour la meilleure présentation étudiante**, Condensed Matter in the Cities, London, UK (Virtual)

03/2021 "Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states", March Meeting of the American Physical Society (Virtual)

06/2020 "Exploring the multiorbital Hund's coupled impurity", Condensed Matter in the Cities, London, UK (Virtual)

03/2020 "Exploring the multiorbital Hund's coupled impurity", March Meeting of the American Physical Society (Virtual)

03/2019 "Potts transitions in Coupled XY Models", March Meeting of the American Physical Society, Boston, USA

### *Posters*

03/2023 "The Hydra algorithm for simulating coupled U(1) models", March Meeting of the American Physical Society, Las Vegas, USA

06/2022    "Interplay of charge and spin fluctuations in a Hund's coupled impurity", Correlated Electron Systems, Gordon Research Seminar, Mount Holyoke College, Massachusetts, USA

11/2021    "Potts transitions in Coupled XY Models", Workshop on Topological Materials and Electron Correlations, Rice Center for Quantum Materials, Houston, TX, USA

05/2021    "Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states", Correlation in Novel Quantum Materials, Max Planck Institute for Solid State Physics, Stuttgart, Germany (Virtual)

10/2019    "Exploring the multiorbital Hund's coupled impurity", Gotham Metro Condensed Matter Meeting, New York, USA

09/2019    "Exploring the multiorbital Hund's coupled impurity", School on Advanced Methods on Strongly Correlated Electrons, Forschmentzing Julich, Germany

08/2019    "Potts transitions in Coupled XY Models", Advanced Workshop and School: Correlations in Electron Systems, Max Planck Institute for Complex Systems, Dresden, Germany

07/2019    "Potts transitions in Coupled XY Models", Princeton Condensed Matter Summer School, Princeton, NJ, USA

08/2018    "$L \cdot S$ Pairing in Iron-Based Superconductors", Advanced Workshop and School: Correlations in Electron Systems, International Center for Theoretical Physics, Trieste, Italy

05/2018    "Potts transitions in Coupled XY Models", International Summer School on Computational Quantum Materials, Sherbrooke, Québec, Canada

08/2017    "Potts transitions in Coupled XY Models", School on Unconventionnal Superconductivity: Experiments and Theory (SUNSET), Cargese, Corsica, France


## Student supervision

2025-now    Shuka Haddadi - MSc in Physics at Université de Sherbrooke. Cosupervised with Pr Stefanos Kourtis.

2025-now    Dorian Lauwerier - PhD in electrical engineering at l'Université de Sherbrooke. Cosupervised with Pr Yves Bérubé-Lauzière.

2024-now    Cédrick Perron - PhD in electrical engineering at l'Université de Sherbrooke. Cosupervised with Pr Yves Bérubé-Lauzière.

2024-now    Yohan Finet - PhD in electrical engineering at l'Université de Sherbrooke. Cosupervised with Pr Yves Bérubé-Lauzière.

2022-2023    Pratyankara (Prathu) Narasimhan - completed his MSc in Physics at Rutgers University on 10/2023 [1 publication]. Cosupervised with Pr Ananda Roy.


## Teaching

2025-now    Ongoing collaboration with Jean-Michel Lemay, Teaching Professor at the École de Technologie Supérieure (ETS) to develop an introductory course on quantum simulation.

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| 2024-now | Helped design an analog quantum computing project for BSQ-201 at Université de Sherbrooke (in collaboration with instructor Sarah-Audrey Blanchette). I have since delivered a lecture of neutral atom quantum computing in Spring 2024, Fall 2024 and Fall 2025. |
| 2024 | Presented an invited lecture on analog quantum computing and neutral atoms in Christophe Pere's QML class at the École de Technologie Supérieure (ETS) in Montreal, Canada. |
| Spring 2020 | Workshop Instructor (3 sections), Rutgers. Ph 204 & 203 - General Physics |
| Fall 2019 | Lab Instructor (1 lab), Rutgers. Ph 161 - Elements of Physics |
| Spring 2018 | Grader, Rutgers. Ph 611 - Graduate Statistical Mechanics |
| Spring 2018 | Recitation Instructor, Rutgers. Ph 204 - General Physics |
| Fall 2016 | Lab Instructor (3 labs), Rutgers. Ph 161 - Elements of Physics |

## Community Engagement & Service

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| 10/2025 | Mentor for the GenQ Quantum Computing Hackathon organized by QAI Ventures, Calgary, Canada |
| 10-11/2024 | Co-Organizer and Judge for the CMC-Pasqal Virtual Workshop and Hackathon on Quantum Computing with Neutral Atoms, Canada |
| 10/2024 | Judge and Mentor for the GenQ Quantum Computing Hackathon organized by QAI Ventures, Calgary, Canada |
| 04/2024 | Participant to the IBM Working Group on Sustainability and Quantum Computing, held at Jouvence, Sherbrooke, Canada |
| 02/2024 | Judge for the QSciTech-QuantumBC Virtual Workshop on Quantum Machine Learning. |
| 10/2023 | Judge for the SherHack 2023 Quantum Hackathon organized by the Institut Quantique's AlgoLab. |
| 10/2023 | Judge and Technical Mentor for the Blaise PASQAL Regenerative Challenge, a Hackathon organized by PASQAL about solving sustainability problems using a neutral atom analog quantum computer. |
| 09/2023 | Technical Mentor at the Chicago Quantum Exchange's BigQ Hactackhon, organized by QuantX. The team worked on addressing a use-case provided by Pacific Northwest National Labs about ressource management and electricity grid optimization using a neutral atom emulator provided by Pasqal. |
| 01/2023 | Participated in person in the MIT iQuHack 2023 Quantum Computer Hackathon in Boston, MA, USA. My team and I (Quintessence) implemented a quantum random walk on a user-defined graph on IonQ's quantum computer, whose output was fed into a LLM to build a novel comic strip for the user. See the GitHub repo. |
| 2020 - 2022 | Graduate Student Reviewer, Aresty Rutgers Undergraduate Research Journal |
| 2019 - 2020 | Co-Organizer, Rutgers Representative, Gotham Metro Condensed Matter Conference |
| 2018 - 2019 | Chancellor, Graduate Student Organization, Physics and Astronomy, Rutgers |
| 2017 - 2018 | Co-President, Graduate Student Organization, Physics and Astronomy, Rutgers |
| 04/2017 | Judge, Aresty Center's 13th annual Undergraduate Research Symposium, Rutgers |
| 2014 - 2016 | Member of the Organizing Committee of the Clubmath, Mathematics Departments, Université de Montréal |

**Referee**

I have reviewed papers for Physical Review {A, B, Applied, Research}.

**Technical Skills**

Programming Languages: Python (expert), Julia (advanced), Matlab (advanced), Wolfram Mathematica (intermediate);
Knowledge of Git, Github and Gitlab;
Experience with parallel computing infrastructure on supercomputers;
Varied experience with quantum computing languages and hardware: Pulser (Pasqal) [advanced], Leap (D-Wave) [advanced], and Qiskit (IBM) [beginner].