

# Isaac De Vlugt – Curriculum Vitae

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**Citizenship** Canadian, American

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**Phone number** 519-520-2937

## Languages

- **English**
- **French**  
Intermediate proficiency  
*Certificat d'études en français intensif* – June 2014  
Strathroy District Collegiate Institute, Strathroy, Ontario

## Programming Languages & Software

- Python
- Julia
- C++
- LaTeX
- Gaussian 09

## Education

- 2019-Current** Candidate for MSc Physics – The University of Waterloo, Waterloo, ON  
Expected date of completion: September 2021
- 2014-2019** BSc Chemical Physics, Honours, Co-operative Program – The University of Waterloo, Waterloo, ON  
University of Waterloo Alumni Gold Medal recipient  
Cumulative GPA: 95.74%  
Dean's Honours List
- 2009-2014** Ontario Secondary School Diploma – Strathroy District Collegiate Institute, Strathroy, ON  
Cumulative GPA: 95%

## Research Employment Experience

- May 2018 - Aug. 2018** Melko Group, The University of Waterloo, Waterloo, ON  
*Software Developer and Research Assistant*  
Under the supervision of Prof. Roger Melko, open-source software to perform quantum state reconstruction using neural networks was developed collaboratively. This research was motivated by the need for access to such software for experimentalists and for other applications in quantum information and condensed matter physics.

- Sept. 2017 -** Roy Group, The University of Waterloo, Waterloo, ON  
**Dec. 2017** *Research Assistant*
- Under the supervision of Prof. P.N. Roy, direct operation (the use of ladder operators) and renormalization groups were proposed as faster routes for diagonalizing the Hamiltonian that describes a rotor-doped  $C_{60}$  based nano-molecular assembly. Direct operation and renormalization group formalisms were implemented in custom-written C++ programs utilizing the ARPACK eigen-solving package. This research was motivated by possible applications that rotor-doped  $C_{60}$  based nano-molecular assemblies may have in quantum information devices.
- Sept. 2016 -** Hopkins Lab, The University of Waterloo, Waterloo, ON  
**Apr. 2017** *Research Assistant*
- Under the supervision of Prof. W.S. Hopkins, density functional theory calculations on transition metal- containing  $B_{12}X_{12}^{2-}$  ( $X = H, F$ ) clusters were performed using Gaussian 09. This theoretical work was done to compare to and justify observations made from infrared multiple photon dissociation spectra obtained from the CLIO (Centre Laser Infrarouge d'Orsay) free-electron laser in France. Experimental data obtained was processed through custom-written programs in Python. Motivation for this work includes applications in quantum computing and chemical hydrogen storage.

## Peer-Reviewed Publications

- Beach, M., De Vlugt, I., Golubeva, A., Huembeli, P., Kulchytskyy, B., Luo, X., Melko, R., Merali, E., Torlai, G. "QuCumber: wavefunction reconstruction with neural networks." *SciPost Phys.* 7.1 (2019): 009
- De Vlugt, I., Lecours, M., Carr, P., Anwar, A., Marta, R., Fillion, E., Steinmetz, V., Hopkins, W. "Infrared-Driven Charge Transfer in Transition Metal-Containing  $B_{12}X_{12}^{2-}$  ( $X = H, F$ ) Clusters." *The Journal of Physical Chemistry A* 122.35 (2018): 7051-7061

## Presentations

- 2018** De Vlugt, I., Iouchtchenko, D., Halverson, T., Roy, P.N. "Computing Bound States of Rotor Chains and Arrays Using Direct Operation and Renormalization Groups." Southern Ontario Undergraduate Student Chemistry Conference, March 2018, Wilfred Laurier University, Waterloo, ON. Presentation Session.

**2017** De Vlugt, I., Iouchtchenko, D., Halverson, T., Roy, P.N. "Computing Bound States of Rotor Chains and Arrays Using Direct Operation." Symposium on Chemical Physics, Nov. 2017, The University of Waterloo, Waterloo, ON. Poster Session.

Iouchtchenko, D., Ganahl, M., De Vlugt, I., Halverson, T., Roy, P.N. "Density Matrix Renormalization Group for the Ground State of Linear Chains of Linear Rigid Rotors with Dipolar Interactions Using the Angular Momentum Ladder Operator." Symposium on Chemical Physics, Nov. 2017, The University of Waterloo, Waterloo, ON. Poster Session.

De Vlugt, I., Lecours, M., Carr, P., Anwar, A., Marta, R., Fillion, E., Steinmetz, V., Hopkins, W. "Infrared-Driven Charge Transfer in Transition Metal  $B_{12}H_{12}^{2-}$  Clusters." Southern Ontario Undergraduate Student Chemistry Conference, March 2017, York University, Toronto, ON. Presentation Session.

**2016** De Vlugt, I., Lecours, M., Carr, P., Anwar, A., Marta, R., Fillion, E., Steinmetz, V., Hopkins, W. "Infrared-Driven Charge Transfer in Cu, Ag and Cd  $B_{12}H_{12}^{2-}$  Clusters." Symposium on Chemical Physics, Nov. 2016, The University of Waterloo, Waterloo, ON. Poster Session.

## Awards and Scholarships

**2019 NSERC Alexander Graham Bell Canada Graduate Scholarship - Masters**  
The CGS M program provides financial support to high-calibre scholars who are engaged in eligible master's or, in some cases, doctoral programs in Canada.

### **President's Graduate Scholarship**

The President's Graduate Scholarship is provided to outstanding graduate students who hold certain major federally and provincially funded competition-based scholarships.

### **University of Waterloo Graduate Scholarship**

The University of Waterloo Graduate Scholarship is awarded to graduate students registered full time in a Master's or Doctoral program at the University of Waterloo with a minimum first-class (80%) cumulative average in their current program or over the last two full-time academic years.

### **University of Waterloo Alumni Gold Medal**

The Office of Alumni Affairs recognizes top graduating students for academic achievement, by awarding the Alumni Gold Medal at convocation.

### **Science Scholarship for Excellence**

Based on academic achievement in the previous year.

### **Chemical Physics Upper-Year Scholarship**

Based on academic achievement in the previous year.

### **NSERC Undergraduate Student Research Award**

NSERC Undergraduate Research Awards enable the recipient to gain research experience by working full time with an NSERC grant holder on a research project in a university laboratory.

- 2018**      **Chemical Physics Upper-Year Scholarship**  
Based on academic achievement in the previous year.
- NSERC Undergraduate Student Research Award**  
NSERC Undergraduate Research Awards enable the recipient to gain research experience by working full time with an NSERC grant holder on a research project in a university laboratory.
- 2017**      **Jerome T. Miller Memorial Prize**  
The prize is awarded on the basis of marks to the student in their third year of a program which combines studies in Chemistry and Physics.
- NSERC Undergraduate Student Research Award**  
NSERC Undergraduate Research Awards enable the recipient to gain research experience by working full time with an NSERC grant holder on a research project in a university laboratory.
- 2016**      **Chemical Physics Upper-Year Scholarship**  
Based on academic achievement in the previous year.
- 2015**      **University of Waterloo President's Scholarship of Distinction**  
This award is given to students who are admitted to the University of Waterloo with an early-May admission average of 95% or above.
- NOVA Chemicals Entrance Scholarship**  
Two scholarships are awarded based on academic performance to students admitted to the University of Waterloo: one to a student entering a Physical Sciences program and one to a student entering Chemical Engineering.
- 2014**      **J. Gladstone Mills Memorial Award**  
For the graduating student with the highest academic excellence.
- M.K. McIntyre Award**  
For the highest grade in grade 12 enriched English.
- World War One Memorial Award**  
For the highest average proceeding to grade 12.
- Meridian Lightweight Technologies Award**  
For the highest grade in grade 12 physics.
- Roger Kennedy Memorial Award**  
For the highest grade in grade 12 chemistry.

## Additional Employment Experience

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| <b>Jan. 2020 -<br/>Current</b>           | The University of Waterloo (Physics Department), Waterloo, ON<br><i>Teaching Assistant (PHYS 122)</i> <ul style="list-style-type: none"><li>• Run a weekly tutorial session for students enrolled in PHYS 122 (simple-harmonic motion, sound, Coulomb's Law and circuits)</li><li>• Mark weekly quizzes</li></ul>  |
| <b>Sept. 2009 -<br/>Current</b>          | Private Guitar Teaching, Strathroy & Waterloo, ON<br><i>Self-employed</i> <ul style="list-style-type: none"><li>• Teach beginner guitar students music theory and performance-enhancing techniques</li></ul>   |
| <b>May 2019 -<br/>July 2019</b>          | LCBO Logistics Facility, London, Ontario<br><i>Warehouse Worker</i> <ul style="list-style-type: none"><li>• Loaded cases of beer, liquor, wine and spirits onto a conveyor belt</li><li>• Improved line speed and strengthened teamworking skills</li></ul>  |
| <b>Jan. 2016-<br/>April 2016</b>         | 360 Education Labs, Waterloo, ON<br><i>Operations Lead and Online Tutor</i> <ul style="list-style-type: none"><li>• Provided regular bilingual online tutoring services to high school students in mathematics, physics and chemistry</li><li>• Executed company operations, such as scheduling and sales assistance</li><li>• Fashioned special marketing and educational curriculum development related projects</li></ul> |
| <b>May 2015 -<br/>Aug. 2015</b>          | Highbury Pools, London, ON<br><i>General Labourer</i> <ul style="list-style-type: none"><li>• Welded vinyl pool liner pieces together for liner-installation companies</li><li>• Learned procedures and operations in a factory setting</li><li>• Accelerated daily production of pool liners</li></ul>  |
| <b>Oct. 2011 -<br/>June 2014</b>         | Union Burger, Strathroy, ON<br><i>Cashier &amp; Chef</i> <ul style="list-style-type: none"><li>• Created a pleasant experience for customers at the cash register</li><li>• Prepared high-quality food in a fast-paced environment</li><li>• Improved workplace efficiency</li></ul>   |
| <b>Summer 2012 &amp;<br/>Summer 2013</b> | Southside Produce, Baton Rouge, LA, USA<br><i>Cashier (seasonal)</i> <ul style="list-style-type: none"><li>• Enhanced the experience customers had at the cash-out area</li><li>• Social skills matured by interacting with customers and employees from diverse cultures</li></ul>  |

## Volunteering & Community Involvement

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| <b>Jan. 2020 -<br/>Current</b> | Kitchener-Waterloo Humane Society, Kitchener, ON<br><i>Volunteer</i> <ul style="list-style-type: none"><li>• Provide animals at the adoption facility a clean and joyful living environment</li><li>• Assist with community outreach events</li></ul>                                      |
| <b>2009 - 2019</b>             | Private Tutoring, Strathroy & Waterloo, ON<br><i>Volunteer</i> <ul style="list-style-type: none"><li>• Provide help sessions for fellow students struggling in certain subjects</li></ul>  |
| <b>Nov. 2017</b>               | Salvation Army, Baton Rouge, LA, USA<br><i>Volunteer</i> <ul style="list-style-type: none"><li>• Prepared and served Thanksgiving meals to those in need during American Thanksgiving</li></ul>  |
| <b>2010</b>                    | Women's Rural Resource Centre, Strathroy, ON<br><i>Walk a Mile in Her Shoes Participant</i> <ul style="list-style-type: none"><li>• Participated in the "Walk a Mile in Her Shoes" event to aid and raise awareness for the local Women's Rural Resource Centre in Strathroy, ON</li></ul> |

## Activities and Interests

- Electric guitar player (2008 - current)
- Avid American football fan