



Paul Vrbik

Curriculum Vitae

www.vrbik.info

Degrees, Qualifications, and Registration

- 2014 **Doctor of Philosophy**, *The University of Western Ontario*.
Computer Science.
- 2009 **Master of Science**, *Simon Fraser University*.
Pure Mathematics.
- 2006 **Bachelor of Science**, *McMaster University*.
Pure Mathematics.

Positions Held

- 2020 – *University of Queensland*.
Senior Lecturer (Teaching Focused) of Electrical Engineering and Computer Science
- 2018 – 2020 *University of Toronto, Missisauga*.
Assistant Professor of Mathematical and Computational Sciences, Teaching Stream
- 2016 – 2018 *University of Queensland*.
Research Associate in the School of Communication and Arts.
- 2014 – 2016 *University of Newcastle, Australia*.
Associate Lecturer of Mathematics.
- 2009 – 2014 *Maplesoft* (via the Ontario Research Center for Computer Algebra).
Software developer (RegularChains).
- FALL 2013 *University of Western Ontario*.
Lecturer of Computer Science.
- SUMMER 2005 *Brock University*.
& 2006 Software developer for the computational chemistry research group.

Research Focus

- SOTL Academic dishonesty. Computer-based testing. Assessment resilience to AI. Active learning. Flipped classrooms.
- COMPUTER Polynomial arithmetic. Solving systems of polynomial equations. Factoring. The
ALGEBRA theory of Regular Chains and Triangular Sets.

Research Outputs

Books

- 2012 *Informal Introduction to Stochastic Processes with Maple* [WEB](#)
AUTHORS Jan Vrbik and Paul Vrbik
PUBLISHER Springer.
ISBN-13 978-1461440567

Articles

(Most works have authors listed alphabetically)

- 2024 *"I Didn't Know": Examining Student Understanding of Academic Dishonesty in Computer Science.* [WEB](#)
AUTHORS M Liut, A Ly, JJN Xu, J Banson, P Vrbik, CD Hardin
PROCEEDINGS 55th ACM Technical Symposium on Computer Science
- 2023 *Competing Patterns in Bernoulli Sequence of Trials.* [PDF](#)
AUTHORS Jan Vrbik and Paul Vrbik
JOURNAL Applied Mathematics. Scientific Research Publishing.
- 2023 *A Novel Proof of the Desnanot-Jacobi Determinant Identity.* [WEB](#)
AUTHORS Jan Vrbik and Paul Vrbik
JOURNAL Mathematics Magazine.
- 2022 *Perceptions of Computing Students on Academic Dishonesty.* [WEB](#)
AUTHORS J Banson, I Cowan, C Hardin, M Liut, P Vrbik
PROCEEDINGS International Society for Technology in Education (ISTE'22)
- 2022 *A systematic review of paper-based versus computer-based testing in engineering and computing education.* [WEB](#)
AUTHORS A Valentine, P Vrbik, R Thomas
PROCEEDINGS IEEE Global Engineering Education Conference (EDUCON)
- 2018 *Phase Portraits of Hyperbolic Geometry.* [WEB](#)
AUTHORS Scott B. Lindstrom and Paul Vrbik.
JOURNAL Mathematical Intelligencer.

- 2018 *PauseCode: Computational Conversation Timing Analysis.* [WEB](#)
AUTHORS Daniel Angus, Yeyan Yu, Paul Vrbik, Andrew Back, Janet Wiles.
PROCEEDINGS 4th International Workshop on Multimodal Analyses Enabling Artificial Agents in Human-Machine Interaction.
- 2018 *Extending the PSLQ Algorithm to Algebraic Integer Relations.* [WEB](#)
AUTHORS Matthew P. Skerritt and Paul Vrbik.
PROCEEDINGS Jonathan M. Borwein Commemorative Conference.
- 2015 *A Standard Basis Free Algorithm for Computing the Tangent Cones of a Space Curve.* [PDF](#)
AUTHORS Parisa Alvandi, Marc Moreno Maza, Éric Schost, Paul Vrbik.
PROCEEDINGS Computer Algebra in Scientific Computing, Aachen, Germany.
- 2014 *Doing Algebraic Geometry with the RegularChains Library.* [PDF](#)
AUTHORS Parisa Alvandi, Changbo Chen, Steffen Marcus, Marc Moreno Maza, Éric Schost, Paul Vrbik.
PROCEEDINGS International Centre for Mathematical Sciences — 4th International Congress, Seoul, South Korea.
- 2012 *Computing Intersection Multiplicity via Triangular Decomposition.* [PDF](#)
AUTHORS Steffen Marcus, Marc Moreno Maza, Paul Vrbik.
DISSERTATION The University of Western Ontario.
- 2012 *An Irrationality Measure for Regular Paper-folding Numbers.* [WEB](#)
AUTHORS Michael Coons and Paul Vrbik.
JOURNAL Journal of Integer Sequences.
- 2012 *Inversion Modulo Zero-dimensional Regular Chains.* [WEB](#)
AUTHORS Marc Moreno Maza, Éric Schost, Paul Vrbik.
PROCEEDINGS Computer Algebra in Scientific Computing, Maribor, Slovenia.
- 2012 *On Fulton's Algorithm for Computing Intersection Multiplicities.* [PDF](#)
AUTHORS Steffen Marcus, Marc Moreno Maza, Paul Vrbik.
PROCEEDINGS Computer Algebra in Scientific Computing, Maribor, Slovenia.
- 2009 *Lazy and Forgetful Polynomial Arithmetic and Applications.* [PDF](#)
AUTHORS Michael Monagan, Paul Vrbik.
PROCEEDINGS Computer Algebra in Scientific Computing, Kobe, Japan.
- 2008 *Gamma Distribution Model To Provide a Direct Assessment of the Overall Quality of Quantum Monte Carlo-Generated Electron Distributions.* [PDF](#)
AUTHORS Braden Coles, Paul Vrbik, Robert D. Giacometti, and Stuart M. Rothstein.
JOURNAL Journal of Physical Chemistry A.
- 2005 *Analysis of diffusion Monte Carlo distributions.* [WEB](#)
AUTHORS Braden Coles, Paul Vrbik, Robert D. Giacometti, and Stuart M. Rothstein.
JOURNAL American Institute of Physics.

Honours and Awards

Awards

2023 Faculty Teaching and Learning Excellence Award at UQ
VALUE \$5 000

2022 Faculty Citation for Excellence in Student Learning at UQ
VALUE \$1 000

Nominations

2024 Dean's Commendation for Excellence in Teaching at UQ
BY Full-time students who achieved a GPA of 6.600 or more.
NUMBER OF Ten.

2023 Dean's Commendation for Excellence in Teaching at UQ
BY Full-time students who achieved a GPA of 6.600 or more.
NUMBER OF Fifteen.

2022 Dean's Commendation for Excellence in Teaching at UQ
BY Full-time students who achieved a GPA of 6.600 or more.
NUMBER OF Seven.

2021 Dean's Commendation for Excellence in Teaching at UQ
BY Full-time students who achieved a GPA of 6.600 or more.
NUMBER OF Four.

2012 Western University Student's Council Teaching Award.
BY Students of CSC 3331.
FOR Excellence in class instruction.

2006 McMaster President's Award.
BY The department of Mathematics and Statistics.
FOR Excellence in student leadership.

Distinctions

2012 Western University, Teaching Honour Roll.

Scholarships

2010 Alexander Graham Bell Canada Graduate Scholarships, Doctorate.
VALUE \$105 000

2008 Graduate Fellowship. Simon Fraser University.
VALUE \$6 250

2008 Mathematics of Information Technology and Complex Systems (MITACS) Industrial
Scholarship.
VALUE \$15 000

Classes Instructed

The University of Queensland (Electrical Engineering and Computing Science)

2020 – *Introduction to Software Engineering* CSSE 1001 / CSSE 7030
ROLE Coordinator and lecturer.
DETAILS 500 – 1500 students. I typically run this course alone.

2020 – *Functional and Logic Programming* COMP 3400
ROLE Coordinator and lecturer.
DETAILS 300 students. Highest ranked course in the department (less one outlier). Designed the curriculum.

2020 – *Programming of Simulation, Analysis, and Learning* MATH 2504
ROLE Lecturer for Computer Algebra module.
DETAILS Designed from scratch by me.

2020 *Theory & Practice in Science* SCIE 1000
ROLE Lecturer for Computer Algebra Module
DETAILS Fought (successfully) to have for-loops added to curriculum.

University of Toronto, Mississauga (Mathematical and Computational Sciences)

2019 *Communication Skills for Computer Scientists* CSC 290
ROLE Coordinator and lecturer
DETAIL Designed and delivered my own curriculum

2019 *Differential Calculus for Life Sciences* MAT 132
ROLE Lecturer.
DETAIL This class employed active learning / flipped classroom approach.

2018, 2019 *Calculus for Life Sciences* MAT 134
ROLE Co-Coordinator and lecturer.
EXTRAS Lectures were recorded and uploaded to YouTube.

2019 *Software Tools and Systems Programming* CSC 209
ROLE Lecturer.

2018, 2019 *Introduction to Computer Programming* CSC 108
ROLE Lecturer.
EXTRAS Designed the lecture slides and recorded and uploaded lectures to YouTube.

University of Newcastle (School of Mathematical and Physical Sciences)

- 2016 *Calculus of Science and Engineering* MATH 2310
ROLE Lecturer.
EXTRAS Wrote 160 pages of course notes.
- 2015, 2016 *Mathematical Discovery 1* MATH 1210
ROLE Lecturer.
EXTRAS Wrote 140 pages of course notes.
- 2015 *Logic and Set Theory* MATH 3010
ROLE Coordinator and lecturer.
EXTRAS Wrote 100 pages of course notes.

University of Western Ontario (Computer Science Department)

- 2012 *Foundations of Computer Science* CSC 3331
ROLE Coordinator and lecturer.
EXTRAS Wrote 160 pages of course notes.

Supervision

Higher Degrees by Research

- 2024 – *Study of Expressivity in Simple Artificial Forms*
Brinez, Carlos Ramirez

Honours

- 2024 *python-flint as a Solution to SymPy's Poor Performance*
Moss, Jake
- 2023 *Implementation of Sparse Polynomial Techniques in SymPy*
Panizza, Benedict Francis
- 2023 *Factoring Polynomials in Haskell*
Richardson, Joel William
- 2022 *Solving the Inverse Kinematic Problem of Planar Robotic Arm Using Groebner Bases With the Existence of Obstacles*
Chia, Vincent
- 2022 *Computationally Lightweight Inverse Kinematics of a Robotic Arm*
Harp, Dante Liam
- 2022 *Implementing Sparse Polynomial Arithmetic in SymPy*
Page, Luke Bennet
- 2022 *Sensor Fusion for Restricted-Movement Robotic Vision*
Waldie, Thomas Samuel

Curriculum Development

More details about the resources I have developed are available in the supplementary materials.

Classes

COMP 3400 *Functional and Logic Programming*

I designed (from scratch) a curriculum for COMP3400 with the objective to equip students with inductive reasoning. Students of this class frequently praise the quality of the course material (522 slides) citing my organization and ability to explain complex topics with simple examples. This class has nearly perfect student feedback and was the course with the strongest student satisfaction (4.97/5 for course; 4.95/5 for teacher) in the school for 2024.

CSSE 1001 *Introduction to Software Engineering*

I wrote an additional 560 slides to supplement the course textbook; rewrote the entire database of online practice problems after analyzing our discussion forums to determine why students were confused by them; moved to the current version of Python and introduced new features such as type hinting; and, most significantly, directed resources towards the establishing of the ITLC (Information Technology Learning Center) which is staffed 5 days a week with teaching assistants.

MATH 2504 *Programming of Simulation, Analysis, and Learning (Data) Systems*

I designed and delivered, a two-week curriculum in Computer Algebra for MATH2504 (Programming of Simulation, Analysis, and Learning Systems) which culminated in a project where students used Julia to factor univariate polynomials.

CSC 108 *Introduction to Computer Programming*

I designed the course slides for the 2018 offering and then adapted them for active learning for our 2019 session.

Resources

uqmath.cls I wrote a bespoke L^AT_EX style for Math and Physics in order to standardize (and clean) their workbooks that had degenerated to a point where no-one could compile them. I also supervised the team that migrated the existing source into the new style.

Lecture Notes

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| 2016 | <i>Calculus of Science and Engineering</i> | PDF |
| 2015 | <i>Logic and Set Theory</i> | PDF |
| 2015 | <i>Mathematical Discovery</i> | PDF |
| 2013 | <i>Foundations of Computer Science</i> | PDF |

References

Dr. Joel Mackenzie

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Dr. Michael Liut

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Department of Mathematical and Computational Sciences

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Dr. Michael Coons

Associate Professor

Department of Mathematics and Statistics

California State University, Chico

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