Robert Y. Lewis

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Positions

2018 – Present **Vrije Universiteit Amsterdam**, The Netherlands
Postdoc, Theoretical Computer Science
Hired through the Matryoshka ERC Starting Grant

2012 – 2018 **Carnegie Mellon University**, Pittsburgh, PA, USA
PhD, Pure and Applied Logic, 2018
MS, Mathematics, 2015
MS, Logic, Computation, and Methodology, 2014

Summer 2016 **Wolfram Research**, Champaign, IL, USA
Intern, Mathematica Algorithms R&D

Summer 2015 **University of Newcastle**, NSW, Australia
Visiting student, CARMA Priority Research Centre

2010 – 2012 **St. Agnes Academy**, Houston, TX, USA
Secondary School Teacher
10^{th} grade geometry, 11^{th} and 12^{th} grade pre-calculus, 12^{th} grade AP Calculus AB

2006 – 2010 **Rice University**, Houston, TX, USA
BA, Mathematics and Philosophy

Peer Reviewed Publications

Normalizing casts and coercions.
Robert Y. Lewis and Paul-Nicolas Madelaine.
In Fontaine, Reummer, and Tourret, eds., *Practical Aspects of Automated Reasoning* (PAAR 2020).

Maintaining a library of formal mathematics.
Floris van Doorn, Gabriel Ebner, and Robert Y. Lewis.
In Benzmüller and Miller, eds., *13th Conference on Intelligent Computer Mathematics* (CICM 2020).

The Lean mathematical library.
The mathlib Community.
In Blanchette, J., Hritcu, C., eds., *9th ACM SIGPLAN International Conference on Certified Programs and Proofs* (CPP 2020), pp. 367-381. 2020.
This paper describes a collective project with many contributors. I am a maintainer of the project and wrote much of this paper.

Formalizing the solution to the cap set problem.
Sander Dahmen, Johannes Hölzl, and Robert Y. Lewis.
In Harrison, J., O'Leary, J., and Tolmach, A., eds., *Interactive Theorem Proving* (ITP 2019), pp. 15:1-15:19. 2019.

A formal proof of Hensel's lemma over the *p*-adic integers.
Robert Y. Lewis.

In Mahboubi, A., Myreen, M. O., eds., *8th ACM SIGPLAN International Conference on Certified Programs and Proofs* (CPP 2019), pp. 15-26. 2019.

An extensible ad hoc interface between Lean and Mathematica.
Robert Y. Lewis.
In Dubois, C. and Paleo, B. W. eds., *Proof eXchange for Theorem Proving 2017* (EPTCS), pp. 23-38. 2017.

A heuristic prover for real inequalities. Journal version.
Jeremy Avigad, Robert Y. Lewis, and Cody Roux.
Journal of Automated Reasoning 56(3), pp. 367-386. 2016.

A heuristic prover for real inequalities.
Jeremy Avigad, Robert Y. Lewis, and Cody Roux.
In Klein, G. and Gamboa, R., eds., *Interactive Theorem Proving* (ITP 2014), pp. 61-76. 2014.

Energy-minimizing unit vector fields.
Leobardo Rosales, Robert Y. Lewis, et al.
Involve 3(4), pp. 435-450. 2010.

Books, Theses, and Drafts

A bi-directional extensible ad hoc interface between Lean and Mathematica. Draft.
Robert Y. Lewis and Minchao Wu.

Mathematics in Lean. A tutorial on the Lean theorem prover for mathematicians.
Jeremy Avigad, Kevin Buzzard, Robert Y. Lewis, and Patrick Massot.
Under development; available online.

Logic and Proof. A textbook using the Lean theorem prover.
Jeremy Avigad, Robert Y. Lewis, and Floris van Doorn.
Available freely in interactive and static versions.

Two Tools for Formalizing Mathematical Proofs. Dissertation.
Robert Y. Lewis.
Certified Feb 16, 2018.

Polya: A Heuristic Procedure for Reasoning with Real Inequalities. MS thesis.
Robert Y. Lewis.
Certified Dec 11, 2014.

Selected Presentations

The Lean mathematical library.

- CPP 2020: Certified Programs and Proofs, New Orleans, LA, USA. 01/2020.

Formalizing the solution to the cap set problem.

- ITP 2019: Interactive Theorem Proving, Portland, OR, USA. 09/2019.
- Vietnam-USA Joint Mathematical Meeting, Quy Nhon, Vietnam. 06/2019.
- CARMA Workshop on Computer-Aided Proof, Newcastle, NSW, Australia. 06/2019. (Invited speaker.)

A formal proof of Hensel's lemma over the *p*-adic integers.

- CPP 2019: Certified Programs and Proofs, Cascais, Portugal. 01/2019.
- Lean Together 2019, Amsterdam, The Netherlands. 01/2019.

A heuristic method for formally verifying real inequalities.

- Matryoshka 2018, Amsterdam, The Netherlands. 06/2018.
- Hales60, Pittsburgh, PA, USA. 06/2018. (Invited speaker.)

Toward AI for Lean, via metaprogramming.

- AITP 2018: Artificial Intelligence in Theorem Proving, Aussois, France. 03/2018.

The Lean theorem prover, for mathematicians.

- Western University Mathematics Dept. Foundations Seminar, London, ON, Canada. 12/2017.

An extensible ad hoc interface between Lean and Mathematica.

- ICMS 2018: International Congress on Mathematical Software, South Bend, IN, USA. 07/2018.
- PxTP 2017: Proof eXchange for Theorem Proving, Brasília, Brazil. 09/2017.
- Wolfram Technology Conference, Champaign, IL, USA. 10/2016.

Automation and computation in the Lean theorem prover.

- HaTT: Hammers for Type Theory, IJCAR, Coimbra, Portugal. 07/2016.
- AITP 2016: Artificial Intelligence in Theorem Proving, Obergurgl, Austria. 04/2016.
- TU München Logic and Verification Seminar, Munich, Germany. 03/2016.

Algebra and analysis in the Lean theorem prover.

- MAP 2016: Effective Analysis, Marseille, France. 01/2016.

Dependent types and the algebraic hierarchy.

- Workshop on Mathematics and Computation, Newcastle, NSW, Australia. 06/2015.

A heuristic prover for real inequalities.

- ITP 2014: Interactive Theorem Proving, Vienna, Austria. 07/2014.
- 6th Podlasie Conference on Mathematics, Bialystok, Poland. 07/2014.
- CMU Graduate Research Sharing Forum, Pittsburgh, PA. 12/2013.

Computers in mathematics: automated and interactive proofs.

- CMU Summer School in Logic and Formal Epistemology, Pittsburgh, PA. 06/2014.

Energy-minimizing vector fields of unit length.

- Rice University VIGRE Summer Seminar, Houston, TX. 07/2009.

Teaching

Spring 2020	**Logic and Modeling** (VU, instructor) (run online due to COVID-19)
Spring 2019	**Logic and Modeling** (VU, instructor)
Spring 2018	**Logic and Modeling** (VU, teaching assistant)
Fall 2016	**Logic and Mathematical Inquiry** (CMU, instructor)
Spring 2015	**Nature of Mathematical Reasoning** (CMU, instructor)
Fall 2014	**Models and Methods of Optimization** (CMU, teaching assistant)
Summer 2014	**Nature of Mathematical Reasoning** (CMU, instructor)
Spring 2014	**Undecidability and Incompleteness** (CMU, grader and guest lecturer)
Fall 2013	**Formal Logic** (CMU, grader and guest lecturer)
2010 – 2012	**Geometry, Pre-calculus, AP Calculus AB** (St. Agnes Academy, instructor)
2007 – 2010	**Honors Calculus III/IV**, **Honors Linear Algebra** (Rice, grader)

Students

All students at VU Amsterdam.

Current	Polina Boneva (BS thesis)
2019	Kevin Kappelmann (MS intern)
2019, 2020	Paul-Nicolas Madelaine (MS intern)
2018 – 2019	Markos Dermitzakis (BS thesis)
2018 – 2019	Phillip Lippe (MS research assistant)
2018 – 2019	Miko Kuijn (MS thesis)
2018	Pablo Le Hénaff (MS intern)

Awards, Grants, and Honors

2020	Microsoft Research on Azure grant (value: $10k)
2019 – 2023	Senior Collaborator, Lean Forward NWO Vidi grant
2017	Laboratory of Symbolic and Educational Computation research fellowship
2017	Future Faculty, Eberly Center for Teaching Excellence & Educational Innovation
2015 – 2016	William S. Dietrich II Presidential PhD Fellowship
2014	Honorable Mention, NSF Graduate Research Fellowship Program

Service

2020	Certified Programs and Proofs 2021 Conference Program Committee
2020	Organizer, Formal Methods in Mathematics / Lean Together workshop
2019 –	Maintainer, Lean mathlib library
2019	Organizer, Lean Together workshop
2018	Organizer, ICMS session on Formal and Informal Mathematical Corpora
2018	Artificial Intelligence and Symbolic Computation Conference Program Committee
2015, 2016	CMU Philosophy Dept. Graduate Admissions Committee
2015	CMU Philosophy Dept. 30th Anniversary Conference Planning Committee
2014 – 2018	Founding member, CMU chapter of Minorities and Philosophy
2013 – 2017	Organizer, CMU Philosophy Dept. Graduate Research Sharing Forum
2011 – 2012	Coach and sponsor, St. Agnes Academy Engineering/Robotics Team
2008 – 2010	Coordinator and tutor, SRC Society of Academic Fellows, Rice University