

CYRIL COHEN, PH.D.

Inria Permanent Researcher (CRCN)

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EXPERIENCE

Full Time Permanent Researcher

Inria

Oct 2014 - Ongoing

Sophia Antipolis, France

- Development of the math-comp ecosystem
- Ph.D. Students (with Y. Bertot):
Boris Djalal (def. Dec 2018), *Damien Rouhling* (def. Sep 2019), *Quentin Vermande* (since Oct 2023).

Consultant

Formal Vindications

July 2019 - June 2022

Barcelona, Spain

Postdoctoral Researcher

Chalmers and Göteborg Universit t

Oct 2012 - Sept 2014

Gothenburg, Sweden

- Development of Cubical Type Theory
- Ph.D. Student (with T. Coquand): *Anders M rtberg* (def. Dec 2014)

PhD Candidate

 cole polytechnique, Inria, Microsoft Research

Sept 2009 - Oct 2012

Palaiseau, France

Advisor: *Assia Mahboubi* & *Benjamin Werner*

Team leader: *Georges Gonthier*

MISCELLANEOUS

- PC member of MAP2015, Coq2016, JFLA2016, CICM2019, CPP2021, FLOC2022 workshops, CADE2023, ITP2023, TYPES2023, LFMTTP2024.
- Steering committee member ITP
- Visitor in LIP since Sep 2023
- Team seminars organization 2013 - 2017
- Reviews or subreviews for JAR, JFR, MSCS, ITP, CPP, FM.
- IAS short-visitor 2012-2013
- Administrator of Coq Zulip

TEACHING

Mathematical Components Research Schools

Inria

2016 - 2022

Sophia Antipolis, France

Undergrad Math Oral Interrogations

CIV

2015 - 2020

Valbonne, France

Paradigms of programming language labs

University of Nice

2014 - 2015

Nice, France

Web programming

 cole polytechnique

2011 - 2012

Palaiseau, France

Algorithmics and Programming in Java

 cole polytechnique

2009 - 2012

Palaiseau, France

Caml lab sessions

Lyc e Stanislas

2007 - 2009

Paris, France

Undergrad Math Oral Interrogations

Louis-Le-Grand

2006 - 2007

Paris, France

RESEARCH TOPICS



Formalization of mathematics

Real algebraic geometry, linear algebra, classical analysis, organizing large libraries of formal maths



Proof engineering

Meta programming, Small scale techniques, Refinement framework



Type theory

Meta theory, HoTT, Cubical TT

COMPUTER SKILLS



LANGUAGES

French (native)

English (proficient)

Portuguese (beginner)

German (notions)



EDUCATION

Ph.D. in Computer Science

 cole polytechnique

2009 - 2012

Palaiseau, France

Real algebraic numbers: construction and first-order theory (defended Nov 2012)

 cole polytechnique Thesis Award

M2 (= M.Sc.) in Computer Science

ENS Cachan

2009

Cachan, France

Agregation of Mathematics laureate

National Education

2008

France

M1 (> B.Sc.) in C.S. and Math

ENS Cachan

2007

Cachan, France

French Baccaaur t S

Lyc e du Mont-Blanc

2003

Passy (74), France

PEER REVIEWED PUBLICATIONS

Journal Papers

- R. Affeldt and CC, "Measure Construction by Extension in Dependent Type Theory with Application to Integration," *Journal of Automated Reasoning*, 2023.
- M. Sozeau, A. Anand, S. Boulrier, *et al.*, "The MetaCoq Project," *Journal of Automated Reasoning*, 2020.
- R. Affeldt, CC, and D. Rouhling, "Formalization Techniques for Asymptotic Reasoning in Classical Analysis," *Journal of Formalized Reasoning*, 2018.
- G. Cano, CC, M. Dénès, A. Mörtberg, and V. Siles, "Formalized Linear Algebra over Elementary Divisor Rings in Coq," *Logical Methods in Computer Science*, 2016.
- CC and T. Coquand, "A constructive version of Laplace's proof on the existence of complex roots," *Journal of Algebra*, 2013.
- CC and A. Mahboubi, "Formal proofs in real algebraic geometry: from ordered fields to quantifier elimination," *Logical Methods in Computer Science*, 2012.

International Conference Proceedings

- CC, E. Crance, and A. Mahboubi, "Troq: Proof Transfer for Free, With or Without Univalence," in *ESOP*, 2024.
- R. Affeldt, CC, and A. Saito, "Semantics of Probabilistic Programs using s-Finite Kernels in Coq," in *CPP*, 2023.
- S. Bernard, CC, A. Mahboubi, and P.-Y. Strub, "Unsolvability of the Quintic Formalized in Dependent Type Theory," in *ITP*, 2021.
- R. Affeldt, CC, M. Kerjean, A. Mahboubi, D. Rouhling, and K. Sakaguchi, "Competing inheritance paths in dependent type theory: a case study in functional analysis," in *IJCAR*, 2020.
- CC, K. Sakaguchi, and E. Tassi, "Hierarchy Builder: algebraic hierarchies made easy in Coq with Elpi," in *FSCD*, 2020.
- R. Chen, CC, J.-J. Levy, S. Merz, and L. Théry, "Formal Proofs of Tarjan's Strongly Connected Components Algorithm in Why3, Coq and Isabelle," in *ITP*, 2019.
- A. Anand, S. Boulrier, CC, M. Sozeau, and N. Tabareau, "Towards Certified Meta-Programming with Typed Template-Coq," in *ITP*, 2018.
- R. Affeldt and CC, "Formal Foundations of 3D Geometry to Model Robot Manipulators," in *CPP*, 2017.
- CC and D. Rouhling, "A Formal Proof in Coq of LaSalle's Invariance Principle," in *ITP*, 2017.
- CC and B. Djalal, "Formalization of a Newton Series Representation of Polynomials," in *CPP*, 2016.
- CC, T. Coquand, S. Huber, and A. Mörtberg, "Cubical Type Theory: a constructive interpretation of the univalence axiom," in *TYPES*, 2015.
- CC and A. Mörtberg, "A Coq formalization of finitely presented modules," in *ITP*, 2014.
- CC, "Pragmatic Quotient Types in Coq," in *ITP*, 2013.
- CC, D. Maxime, and A. Mörtberg, "Refinements for Free!" In *CPP*, 2013.
- G. Gonthier, A. Asperti, J. Avigad, *et al.*, "A Machine-Checked Proof of the Odd Order Theorem," in *ITP*, 2013.
- CC, "Construction of real algebraic numbers in Coq," in *ITP*, 2012.
- CC and A. Mahboubi, "A formal quantifier elimination for algebraically closed fields," in *Calculemus*, 2010.

TALKS

INVITED TALK = 

Troq: Proof Transfer for Free

- Lean For The Curious Mathematician**
@ CIRM Mar'24 Marseille, Fr
- ChoCoLa** Dec'23 Lyon, FR

Hierarchy Builder

- Machine-Checked Math** Jul'23 Leiden, NL
- Workshop Schlumberger** Jun'22 Orsay, FR
- GReTA ExACT seminar** Nov'21 Online
- FoMM workshop** Jan'20 Pittsburg, US

Tutorial: Mathematical Components

- JFLA 2023** Jan'23 Praz-sur-Arly, FR
- IRIF** Dec'21 Paris, FR

Unsolvability of the Quintic

- T. Coquand 60th** Aug'22 Göteborg, SE

Demo: unification hints in Lean

Lean Together Jan'19 Amsterdam, NL

Formalization techniques for classical analysis

- Seminar 18341** Aug'18 Dagstuhl, DE
- FoMA workshop** Jun'18 Pittsburg, US
- FastRelax meeting** Jun'18 Sophia Anti., FR

Mathematical Components analysis

- Lean Together** Jan'19 Amsterdam, NL
- Coq Workshop** Jul'18 Oxford, UK

3D geometry for robotics

EU-Cost Types Jan'18 Nijmegen, NL

Mathematical Components and algebraic num.

- CCA 2017** Aug'17 Daejeon, KR

The matrix library

Mathcomp tutorial @ ITP Aug'16 Nancy, FR

Formalization of a sign determination algorithm

- Fields Institute** Dec'15 Toronto, CA
- TYPES 2015** May'15 Tallinn, EE

Typeclasses and Setoids

Coq tutorial @ ITP Aug'15 Nanjing, CN

Refinements for free!

68nqrt seminar Jun'15 Rennes, FR

A cubical evaluation model for Type Theory

Cosynus seminar, X Apr'15 Palaiseau, FR

Mathematical Components and algebraic num.

- TPP 2014** Dec'14 Fukuoka, JP

A Coq formalization of fin. presented modules

Marelle seminar Nov'13 Sophia Anti., FR

Reasoning about big enough num. in Coq

4th Coq Workshop Aug'12 Princeton, US

Formalization of algebraic numbers in Coq

- π **r² seminar** Mar'13 Paris, FR
- Toccata seminar** Feb'13 Orsay, FR
- Plume seminar** Feb'13 Lyon, FR

Construction of real algebraic numbers in Coq

- Brower Seminar** 2012 Nijmegen, NL
- MAP 2011** 2011 Leyden, NL