

Érik MARTIN-DOREL

French nationality

PhD in Computer Science

Maître de Conférences at the University Paul Sabatier

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Curriculum Vitæ – as of September 2018

Professional Experience

Since the 1st September 2014: Associate Professor (*Maître de Conférences*) at the University Toulouse III – Paul Sabatier, in the ACADIE team of the IRIT research laboratory.

Oct. 2013→Aug. 2014: Postdoc in the Toccata team at Inria Saclay – Île-de-France, funded by the Verasco¹ of the French ANR.

Oct. 2012→Sep. 2013: Postdoc in the Marelle project-team at Inria Sophia-Antipolis – Méditerranée, funded by the TaMaDi² project of the French ANR.

2009-2012: PhD thesis in Computer Science in *École Normale Supérieure de Lyon*.

Dissertation title: “Contributions to the Formal Verification of Arithmetic Algorithms”.

Date of PhD defense: 26 September 2012.

Distinction: *Très Honorable*.

PhD advisers: Jean-Michel MULLER and Micaela MAYERO.

Laboratory: LIP (UMR 5668 CNRS, ENS de Lyon, Inria, UCB Lyon 1, Univ. de Lyon), in project-team AriC (Arithmetic and Computing), formerly known as the Arénaire team.

Graduate school: *École Doctorale Informatique et Mathématiques de Lyon* (InfoMaths)

Members of the PhD defense jury:

<i>president</i>	Paul ZIMMERMANN	Senior researcher, Inria Nancy Grand Est
<i>reviewer</i>	Yves BERTOT	Senior researcher, Inria Sophia-Antipolis
<i>reviewer</i>	John HARRISON	Senior researcher, INTEL Corporation
<i>reviewer</i>	Frédéric MESSINE	Associate professor “HDR”, ENSEEIHT, IRIT
<i>examiner</i>	Sylvie BOLDO	Researcher, Inria Saclay – Île-de-France
<i>adviser</i>	Micaela MAYERO	Associate professor, IUT of Villetaneuse & LIP
<i>adviser</i>	Jean-Michel MULLER	Senior researcher, CNRS, LIP.

Education

2009: Master’s internship completed in lab. ÉLIAUS in UPVD, under the joint supervision of Marc DAUMAS and Annick TRUFFERT. Master’s thesis entitled *Une théorie de l’espérance*.

2007-2009: Master’s degree in Mathematics and Computer Science, obtained with honors in the University Montpellier 2 (UM2). Merit scholarships awarded throughout these two years.

2005-2007: Bachelor’s degree in Mathematics, obtained with highest honors in the University of Perpignan Via Domitia (UPVD).

2004-2005: Preparatory classes: “MPSI” (one-year undergraduate intensive course in Mathematics, Physics and Engineering Sciences) in Perpignan.

2004: *Baccalauréat Scientifique* with major in Mathematics, obtained with highest honors in Perpignan, France.

¹<http://verasco.imag.fr/>

²<http://tamadiwiki.ens-lyon.fr/>

Supervision of research activities

April→June 2009 I supervised an undergraduate project by Jérémy REYNAERTS in Mathematics and Computer Science, under the responsibility of Samira EL YACOUBI and Marc DAUMAS, in the University of Perpignan Via Domitia.

March→July 2017 I co-supervised (with Sergei SOLOVIEV) the Master 2 internship of Farid MOKRANI at the IRIT lab / University Paul Sabatier.

Invited stays

September 2010 Invitation by Marc DAUMAS and Patrick VILAMAJO in lab. PROMES (UPR CNRS 8521) in Perpignan, where I gave a tutorial on the PVS proof assistant.

Summer 2012 Invitation by César MUÑOZ (research computer scientist at NASA) in National Institute of Aerospace in Hampton, Virginia, USA, from 19 August to 22 September 2012. During this stay and collaborating with C. MUÑOZ and Anthony NARKAWICZ, I undertook the formalization of a library on “rigorous polynomial approximation” in the PVS proof assistant, inspired by some results that I contributed to formalize in the Coq proof assistant during my PhD thesis.

Spoken languages

French Mother tongue.

English Fluent. Learned for 7 years at high school, then for 3 years in higher education. Most of university reading in English-language textbooks. Since 2008, several stays in the USA.

German Good command. Learned for 5 years at high school.

Languages and computer skills³

- *Operating systems*: GNU/Linux^[M] (Debian, Ubuntu, Fedora) and Windows^[M]
- *OS-level virtualization*: Docker^[E+]
- *Formal proof assistants*: Coq^[E+] and PVS^[M]
- *Functional programming*: OCaml^[E+], Emacs Lisp^[M], Scheme^[B+]
- *Object oriented programming*: Java^[M+], Python 3^[M+], Visual C#^[B], C++^[B]
- *Imperative programming*: Visual Basic 6^[B], Turbo Pascal 7^[B], Ada 95^[B], C^[B]
- *Scripting languages*: Bash^[E], Perl^[M], VBA^[B]
- *Back-office web development*: Java EE/Spring Boot/Spring-WS/Spring REST/JAX-RS^[M+]
- *Front-office web development*: HTML5^[B], CSS3^[B], JavaScript^[M+], Vue.js^[B+]
- *CMS for web development*: WordPress^[M]
- *XML languages*: XHTML^[M], XSD^[M+], XPath^[M+], XSLT^[M+]
- *Computer algebra systems*: Maple^[M], PARI/GP^[M], Sollya^[M], Gnuplot^[B], Matlab^[B]
- *Productivity software*: Microsoft Office^[M], LibreOffice^[M]
- *Typesetting systems*: L^AT_EX^[M], Beamer^[M], TikZ^[M], Inkscape^[B]
- *Build management systems*: GNU Make^[M], Apache Maven^[M+]
- *Continuous Integration platforms*: Travis CI^[M+], GitLab CI^[M]
- *Version control systems*: Git^[E+], Subversion^[M], CVS^[M]

Other interests

Piano: I have been playing the piano since the age of 6, when I joined the Conservatoire of Music in Perpignan, and I got my “DEM” (Diploma of Music studies) in 2002, which

³Caption: _[B] stands for Base knowledge, _[M] for Mastery, and _[E] for Expertise. A superscript ‘+’ indicates that I have lectured on this topic at the University.

gathers a First Prize in Music theory, a First Prize in Piano, and a First Prize in Chamber music.

Harmony: I attended the Harmony course by Florence ROLLET from 2001 to 2007, and I was awarded the Prize in Harmony by the *Société des Auteurs, Compositeurs et Éditeurs de Musique* (SACEM) in 2004.

Sport: Swimming.

Licence: Driving licence holder.

Publications and software developments

Articles in peer-reviewed international journals

- [1] Érik MARTIN-DOREL, Guillaume HANROT, Micaela MAYERO, and Laurent THÉRY. “Formally Verified Certificate Checkers for Hardest-to-Round Computation”. In: *Journal of Automated Reasoning* 54.1 (2015), pages 1–29. ISSN: 0168-7433. DOI: [10.1007/s10817-014-9312-2](https://doi.org/10.1007/s10817-014-9312-2). URL: http://www.irit.fr/~Erik.Martin-Dorel/ecrits/Hensel-JAR_2014_Martin-Dorel_et_al_postprint.pdf.
- [2] Érik MARTIN-DOREL and Guillaume MELQUIOND. “Proving Tight Bounds on Univariate Expressions with Elementary Functions in Coq”. In: *Journal of Automated Reasoning* (2015), pages 1–31. DOI: [10.1007/s10817-015-9350-4](https://doi.org/10.1007/s10817-015-9350-4). URL: <http://www.irit.fr/publis/ACADIE/CoqInterval-JAR.pdf>.
- [3] Érik MARTIN-DOREL, Guillaume MELQUIOND, and Jean-Michel MULLER. “Some issues related to double rounding”. In: *BIT Numerical Mathematics* 53.4 (2013), pages 897–924. DOI: [10.1007/s10543-013-0436-2](https://doi.org/10.1007/s10543-013-0436-2). URL: <http://hal.inria.fr/ensl-00644408v3/en/>.
- [4] Marc DAUMAS, David LESTER, Érik MARTIN-DOREL, and Annick TRUFFERT. “Improved bound for stochastic formal correctness of numerical algorithms”. In: *Innovations in Systems and Software Engineering* 6.3 (2010), pages 173–179. ISSN: 1614-5046. DOI: [10.1007/s11334-010-0128-x](https://doi.org/10.1007/s11334-010-0128-x).

Articles in the proceedings of peer-reviewed international conferences

- [5] Érik MARTIN-DOREL and Sergei SOLOVIEV. “A Formal Study of Boolean Games with Random Formulas as Payoff Functions”. In: *Post-Proc. of TYPES 2016, Novi Sad, 23/05/2016-26/05/2016*. Edited by Herman GEUVERS, Silvia GHILEZAN, and Jelena IVETIC. LIPIcs. To appear. Schloss Dagstuhl Leibniz-Zentrum für Informatik, 2018.
- [6] Érik MARTIN-DOREL and Pierre ROUX. “A reflexive tactic for polynomial positivity using numerical solvers and floating-point computations”. In: *Proceedings of the 6th ACM SIGPLAN Conference on Certified Programs and Proofs, CPP 2017, Paris, France, January 16-17, 2017*. Edited by Yves BERTOT and Viktor VAFEIADIS. ACM, 2017, pages 90–99. ISBN: 978-1-4503-4705-1. DOI: [10.1145/3018610.3018622](https://doi.org/10.1145/3018610.3018622). URL: <https://hal.archives-ouvertes.fr/hal-01510979>.
- [7] Stéphane Le ROUX, Érik MARTIN-DOREL, and Jan-Georg SMAUS. “An Existence Theorem of Nash Equilibrium in Coq and Isabelle”. In: *Proceedings Eighth International Symposium on Games, Automata, Logics and Formal Verification, GandALF 2017, Roma, Italy, 20-22 September 2017*. Edited by Patricia BOUYER, Andrea ORLANDINI, and Pierluigi San PIETRO. Volume 256. EPTCS. 2017, pages 46–60. DOI: [10.4204/EPTCS.256.4](https://doi.org/10.4204/EPTCS.256.4).

- [8] Érik MARTIN-DOREL, Micaela MAYERO, Ioana PAŞCA, Laurence RIDEAU, and Laurent THÉRY. “Certified, Efficient and Sharp Univariate Taylor Models in COQ”. In: *SYNASC 2013*. Timișoara, Romania: IEEE, 2013, pages 193–200. DOI: [10.1109/SYNASC.2013.33](https://doi.org/10.1109/SYNASC.2013.33). URL: <http://hal.inria.fr/hal-00845791v2/en/>.
- [9] Nicolas BRISEBARRE, Mioara JOLDEȘ, Érik MARTIN-DOREL, Micaela MAYERO, Jean-Michel MULLER, Ioana PAŞCA, Laurence RIDEAU, and Laurent THÉRY. “Rigorous Polynomial Approximation Using Taylor Models in Coq”. In: *NASA Formal Methods 2012*. LNCS. Norfolk, Virginia: Springer, 2012, pages 85–99. DOI: [10.1007/978-3-642-28891-3_9](https://doi.org/10.1007/978-3-642-28891-3_9). URL: <http://hal.inria.fr/ensl-00653460v2/en/>.
- [10] Nicolas BRISEBARRE, Mioara Maria JOLDEȘ, Peter KORNERUP, Érik MARTIN-DOREL, and Jean-Michel MULLER. “Augmented precision square roots, 2-D norms, and discussion on correctly rounding $\sqrt{x^2 + y^2}$ ”. In: *IEEE ARITH 2011*. Tuebingen, Germany: IEEE, 2011, pages 23–30. DOI: [10.1109/ARITH.2011.13](https://doi.org/10.1109/ARITH.2011.13). URL: <http://hal.inria.fr/ensl-00545591/en/>.
- [11] Nicolas BRISEBARRE, Miloš ERCEGOVAC, Nicolas LOUVET, Érik MARTIN-DOREL, Jean-Michel MULLER, and Adrien PANHALEUX. “Implementing Decimal Floating-Point Arithmetic through Binary: Some Suggestions”. In: *IEEE ASAP 2010*. Rennes, France: IEEE, 2010, pages 317–320. DOI: [10.1109/ASAP.2010.5540969](https://doi.org/10.1109/ASAP.2010.5540969). URL: <http://hal.inria.fr/ensl-00463353/en/>.
- [12] Marc DAUMAS, David LESTER, Érik MARTIN-DOREL, and Annick TRUFFERT. “Stochastic formal correctness of numerical algorithms”. In: *NASA Formal Methods 2009*. Moffett Field, California, 2009, pages 136–145. URL: <http://ti.arc.nasa.gov/m/events/nfm09/proceedings.pdf>.
- [13] Marc DAUMAS, Érik MARTIN-DOREL, Annick TRUFFERT, and Michel VENTOU. “A Formal Theory of Cooperative TU-Games”. In: *Modeling Decisions for Artificial Intelligence 2009*. LNCS. Awaji Island, Japan: Springer, 2009, pages 81–91. DOI: [10.1007/978-3-642-04820-3_8](https://doi.org/10.1007/978-3-642-04820-3_8). URL: http://www.irit.fr/~Erik.Martin-Dorel/ecrits/MDAI_2009_Daumas_et_al_postprint.pdf.

Article in the proceedings of a peer-reviewed national conference

- [14] Marc DAUMAS, Érik MARTIN-DOREL, and Annick TRUFFERT. “Bornes quasi-certaines sur l’accumulation d’erreurs infimes dans les systèmes hybrides”. In: *MajecSTIC 2009*. 8 pages. Avignon, France, 2009. URL: http://majecstic2009.univ-avignon.fr/Actes_MajecSTIC_RJCP/MajecSTIC/articles/1032.pdf.

Article accepted in a peer-reviewed international workshop

- [15] Érik MARTIN-DOREL. “Univariate and Bivariate Integral Roots Certificates Based on Hensel Lifting”. In: *Coq-3, the Coq Workshop 2011*. Extended abstract. Nijmegen, Netherlands, Aug. 2011. URL: http://www.cs.ru.nl/~spitters/coqw_files/program.html.

Research reports

- [16] Érik MARTIN-DOREL and Sergei SOLOVIEV. *A Formal Study of Boolean Games with Random Formulas as Pay Functions*. Rapport de recherche IRIT/RR-2017-01-FR. Université Paul Sabatier, Toulouse: IRIT, Feb. 2017. URL: <https://www.irit.fr/publis/ACADIE/IRIT-RR-2017-01-FR.pdf>.

- [17] Érik MARTIN-DOREL and Guillaume MELQUIOND. *Proving Tight Bounds on Univariate Expressions in Coq*. Rapport de recherche IRIT/RR-2014-09-FR. 32 pages. Université Paul Sabatier, Toulouse: IRIT, Nov. 2014. URL: <http://www.irit.fr/publis/ACADIE/IRIT-RR-2014-09-FR.pdf>.
- [18] Érik MARTIN-DOREL. *Univariate and Bivariate Integral Roots Certificates Based on Hensel's Lifting*. Research Report RRLIP2011-1. 18 pages. LIP, ENS de Lyon, Mar. 2011. URL: <http://hal.inria.fr/ensl-00575673/en/>.

PhD manuscript

- [19] Érik MARTIN-DOREL. “Contributions to the Formal Verification of Arithmetic Algorithms”. PhD thesis. Lyon, France: École Normale Supérieure de Lyon, Sept. 2012. URL: http://www.irit.fr/~Erik.Martin-Dorel/ecrits/MARTIN-DOREL_Erik_2012_these.pdf.

Software

- [20] Érik MARTIN-DOREL and Guillaume MELQUIOND. *The **Drincq** library on Double Roundings in the Coq proof assistant*. 2011–2013. URL: <http://tamadi.gforge.inria.fr/DbLRnd/>.
- [21] Érik MARTIN-DOREL, Micaela MAYERO, Ioana PAȘCA, Laurence RIDEAU, and Laurent THÉRY. *The **CoqApprox** library for rigorous polynomial approximation in the Coq proof assistant*. 2010–2015. URL: <http://tamadi.gforge.inria.fr/CoqApprox/>.
- [22] Érik MARTIN-DOREL and Laurent THÉRY. *The **CoqHensel** library for effective certificate checkers based on Hensel's lemma in the Coq proof assistant*. 2010–2015. URL: <http://tamadi.gforge.inria.fr/CoqHensel/>.
- [23] Érik MARTIN-DOREL. *A PVS library on cooperative **TU-games***. Distributed among the NASA PVS libraries. 2009. URL: <http://shemesh.larc.nasa.gov/fm/ftp/larc/PVS-library/>.

Communications

Talks given at international conferences

1. Talk entitled “Formal methods for rare failures of long processes” at SCAN 2008 at the University of Texas at El Paso, USA, on the 1st October 2008.
2. Talk entitled “Stochastic formal correctness of numerical algorithms” at NASA Formal Methods 2009, in the NASA Ames research center in Moffett Field, California, USA, on 8 April 2009.
3. Talk entitled “Formalization of Hensel's lemma in Coq” at TYPES 2010 in the University of Warsaw Library, Poland, on 13 October 2010.
4. Talk entitled “Univariate and Bivariate Integral Roots Certificates Based on Hensel Lifting” at Coq-3 in Berg-en-Dal, Nijmegen, the Netherlands, on 26 August 2011.
5. Talk entitled “Certified Polynomial Approximation for Solving the Table Maker's Dilemma” at TYPES 2011 in Bergen, Norway, on 9 September 2011.
6. Talk entitled “Rigorous Polynomial Approximation Using Taylor Models in Coq” at NASA Formal Methods 2012 in Norfolk, Virginia, USA, on 5 April 2012.
7. Talk entitled “Certified, Efficient and Sharp Univariate Taylor Models in COQ” at SYNASC 2013 in Timișoara, Romania, on 26 September 2013.

8. Talk entitled “CoqInterval: A Toolbox for Proving Non-linear Univariate Inequalities in Coq” at the MAP 2016 conference (Effective Analysis: Foundations, Implementations, Certification) held in CIRM (Luminy, Marseille), on 12 January 2016.

Poster presented at an international conference

1. Poster entitled “Implementing Decimal Floating-Point Arithmetic through Binary: some Suggestions” presented at IEEE ASAP 2010, in lab. IRISA in Rennes, France, on 9 July 2010.

Talks given at national conferences

1. Talk entitled *Bornes quasi-certaines sur l’accumulation d’erreurs infimes dans les systèmes hybrides* at MajecSTIC 2009, in the University of Avignon, France, on 16 November 2009.
2. Talk entitled “Formal Verification of Certificates Using Hensel’s Lemma” at GT-Verif 2013 held in *École Normale Supérieure de Cachan*, on 17 June 2013.
3. Talk entitled “Formal proofs and certified computation in Coq” at Games 2015 (the French Symposium on Games) held in University Paris Diderot, on 29 May 2015.
4. Talk entitled “Proving Tight Bounds on Univariate Expressions with Elementary Functions in Coq” at FAC’2016 held in LAAS-CNRS, on 31st March 2016.

Invitation in a seminar outside France

1. Talk entitled “Formalization of Rigorous Polynomial Approximation” at the seminar of the Formal Methods Team of the NASA Langley Research Center, on 20 September 2012.

Invitations in seminars or workgroups in France

1. Talk entitled “Formalization of Hensel’s Lemma in Coq” at the GT Coq workgroup, common to teams Arénaire and Plume of lab. LIP in *École Normale Supérieure de Lyon*, on 10 March 2010.
2. Talk entitled “Searching Worst Cases in Single Precision and Formalizing Hensel’s Lemma in Coq” at the TMD (Table Maker’s Dilemma) workgroup of lab. LIP in *École Normale Supérieure de Lyon*, on 7 April 2010.
3. Talk entitled “Formalization of Hensel’s Lemma in Coq” at the seminar of project-team Marelle in Inria Sophia-Antipolis, on 25 June 2010.
4. Talk entitled “Taylor Models for solving the Table Maker’s Dilemma” at the seminar of the LCR team of lab. LIPN in the University Paris 13, on 27 June 2011.
5. Talk entitled “Rigorous Polynomial Approximation: Taylor Models Inside the Coq Proof Assistant” at the seminar of the AriC project-team of lab. LIP in *École Normale Supérieure de Lyon*, on 29 March 2012.
6. Talk entitled *CoqHensel: du lemme de Hensel aux certificats ISValP* at the seminar of project-team Marelle in Inria Sophia-Antipolis, on 18 February 2013.
7. Talk entitled “CoqHensel: Formal Verification of Certificates Using Hensel’s Lemma in Coq” at the seminar of the Toccata team of Inria Saclay, in lab. LRI, on the 1st March 2013.
8. Talk entitled “Certified, Efficient and Sharp Univariate Taylor Models in COQ” at the seminar of the Marelle project-team of Inria Sophia-Antipolis, on 26 August 2013.
9. Talk entitled “Formal proofs and certified computation in Coq for solving the Table Maker’s Dilemma” at RAIM 2013 (*Rencontres Arithmétiques de l’Informatique Mathématique*) held in IHP (*Institut Henri Poincaré*) in Paris, on 19 November 2013.
10. Talk entitled “CoqApprox: a certified library of rigorous polynomial approximation in Coq” at the VALS seminar at LRI in Orsay, on 17 January 2014.
11. Talk entitled “Formal proofs and certified computation in Coq for solving the Table Maker’s Dilemma” at the ACADIE seminar at IRIT in Toulouse, on the 21st March 2014.

12. Talk entitled “CoqInterval: a *Taylor models* aware tactic for proving non-linear inequalities” at the plenary meeting of the Verasco ANR project at Inria Paris, on the 11 June 2014.
13. Talk entitled “Formal proofs and certified computation in Coq for verifying mathematical libraries”, at the IRIT/UPS seminar on 25 September 2014, and at ENSEEIHT on 9 October 2014.
14. Talk entitled *Des erreurs prouvées correctes* for the ACADIE autumn meeting at IRIT/ENSEEIHT on 17 October 2014, and for the Theme 7 annual meeting (Safety of software development) at IRIT/UPS, on 24 October 2014.
15. Talk entitled “Proving Tight Bounds on Univariate Expressions with Elementary Functions in Coq” for the MAC seminar at LAAS–CNRS, on 24 November 2015.
16. Talk entitled “CoqInterval: A Toolbox for Proving Non-linear Univariate Inequalities in Coq” for the ACADIE seminar at ENSEEIHT on 27 January 2016.

Participation in the events of the TaMaDi project

1. Talk entitled “An experience around Hensel’s lemma” at the kick-off meeting of the TaMaDi ANR project, held in *École Normale Supérieure de Lyon* on 27 October 2010.
2. Talk entitled “Implementation of Taylor Models in Coq” at the TaMaDi/CoqApprox meeting in *École Normale Supérieure de Lyon*, on 14 June 2011.
3. Talk entitled “Formal Proofs in Coq for Taylor Models: Towards tighter error bounds for base functions and division” at the TaMaDi/CoqApprox meeting in *École Normale Supérieure de Lyon*, on 11 July 2012.
4. Talk entitled *CoqApprox: Bilan et Perspectives* at the TaMaDi meeting held in Jussieu, Paris, on 18 October 2012.
5. Talk entitled “Formalization of Rigorous Polynomial Approximation in PVS — Feedback on my PVS internship at NIA with César MUÑOZ & Anthony NARKAWICZ” at the TaMaDi meeting held in lab. LIP6 in the University Paris 6, on 19 October 2012.
6. Talk entitled “Advances in the Formalisation of Univariate Taylor Models in COQ” at the TaMaDi/CoqApprox meeting in *École Normale Supérieure de Lyon*, on 16 July 2013.
7. Talk entitled “Towards Formally Verified Optimisation in COQ – Combining CoqApprox and univariate Bernstein polynomials” at the TaMaDi/CoqApprox meeting in *École Normale Supérieure de Lyon*, on 16 July 2013.
8. Talk entitled “*Bilan de la partie CoqApprox* — Debriefing of the CoqApprox formalisation” at the final TaMaDi meeting in *École Normale Supérieure de Lyon*, on 7 October 2013.
9. Talk entitled “CoqHensel: from Hensel’s lemma to the verification of ISValP certificates in Coq” at the final TaMaDi meeting in *École Normale Supérieure de Lyon*, on 8 October 2013.