

**Martín H. Escardó.** BSc, MSc, PhD

Last updated June 6, 2023. See also <http://www.cs.bham.ac.uk/~mhe/>

I was born in Rio de Janeiro, Brazil. I am married and have three children, born in 1998, 2000 and 2010.

## Career Record

2020–	<b>Proof of Theoretical Computer Science</b> , University of Birmingham.
2006–2020	<b>Reader of Theoretical Computer Science</b> , University of Birmingham.
2000–2005	<b>Lecturer of Computer Science</b> , University of Birmingham.
1999–2000	<b>Lecturer of Computer Science</b> , University of St Andrews.
1997–1999	<b>Lecturer of Computer Science</b> , University of Edinburgh.
1996–1997	<b>Research Associate</b> , Imperial College of the University of London.
1990–1991	<b>Software Engineer</b> , Nutec Informatica, Brazil.
1986–1990	<b>System designer</b> , Altus Sistemas de Informatica, Brazil.
1984–1986	<b>Computer programmer</b> , NDT, UFRGS, Brazil.

## Academic Qualifications

1998	Course on Teaching and Learning (TLA Centre, University of Edinburgh).
1997	PhD in Computer Science (Imperial College of the University of London).
1993	MSc by research in Computer Science (UFRGS, Brazil).
1990	BSc in Computer Science (UFRGS, Brazil).

## Academic Awards

2021	Best Paper Award for Junior Researcher for FSCD conference paper with PhD student Tom de
1996	Hilfred Chau Prize for transfer from MPhil to PhD registration.
1993	Brazilian Computer Science Association award for MSc theses.
1990	Brazilian Computer Science Association award for BSc projects.

## Research

**Current interests:** homotopy type theory, univalent foundations, topology, domain theory, continuous lattices in analysis and topology, effective real analysis, topological methods in theoretical computer science, locale theory, programming language semantics, higher-type computability,  $\lambda$ -calculus, functional programming, proof theory, game theory, constructive mathematics.

## Membership of Editorial Boards

2018- APCS (Applied Categorical Structures).

2004- LMCS (Logical Methods in Computer Science).

2002-2015 MSCS (Mathematical Structures in Computer Science).

### **Guest Editorship of special issues of journals**

- 2010 *Logical Methods in Computer Science*. Selected papers of LICS'2010, with Jean-Pierre Jouannaud and Anca Muscholl. Ongoing.
- 2010 *Logical Methods in Computer Science*. Selected papers CCA'2010, with Klaus Weihrauch, Xizhong Zheng, Ning Zhong. Ongoing.
- 2006 *Mathematical Structures in Computer Science*. Volume 16, number 2, April 2006. *In honour of Klaus Keimel*. Selected papers of the Domains VII workshop held in Darmstadt in 2004. Joint with A. Jung and T. Streicher.
- 2004 *Theoretical Computer science*, volume 316, no. 1-3. *Recent Developments in Domain Theory: A collection of papers in honour of Dana S. Scott*. Dedicated to the Domain Theory workshops in Copenhagen (2002) and Birmingham (2002). Joint with L. Birkedal, A. Jung and G. Rosolini.
- 2004 *Electronic Notes in Theoretical Computer Science* (ENTCS), volume 73. Post-conference proceedings of the Domain Theory Workshop VI in Birmingham (2002). Joint with A. Jung.
- 2004 *Journal of Logic and Algebraic Programming*, volume 64, issue 1, July 2005, *Practical Development of Exact Real Number Computation*. Joint with N. Müller and P. Zimmermann.
- 2003 *Theoretical Computer Science*, volume 294, no. 1-2. Joint with Jiri Adamek and Martin Hofmann. Selected papers of the 8th Category Theory and Computer Science Conference (CTCS'99), 10-12 September 1999, Edinburgh, Scotland, organized by S. Abramsky, P. Dybjer, E. Moggi, and A. Pitts.

### **Invited lectures at international meetings**

- 2023 CIRM (Centre International de Rencontres Mathématiques), Type Theory, Constructive Mathematics and Geometric Logic Théorie des types, mathématiques constructives et logique géométrique 1 – 5 May 2023.
- 2022 CSL (Computer Science Logic) invited speaker, “Seemingly impossible programs and proofs”, February 14-19.
- 2019 Compact, totally separated and well-ordered types in univalent mathematics, Mathematical Logic and Constructivity: The Scope and Limits of Neutral Constructivism, Department of Mathematics, Stockholm University, August 20–23, 2019.

- 2018 Univalent Mathematics at Work, invited speaker for the special session Proof Theory and Constructivism at the Logic Colloquium, July 23-28, 2018 at the University of Udine, Italy.
- 2015 Tutorial on Homotopy Type Theory at MFPS (Mathematical Foundations of Programming Semantics).
- 2014 Proof, Structure, Computation, a satellite workshop of CSL-LICS, 17-18 July, Vienna Summer of Logic.
- 2014 CCA 2014 Computability and Complexity in Analysis July 21-24, 2014, Darmstadt, Germany.
- 2014 Workshop on "Semantics of proofs and programs", to be held in Paris June 10-14 2014, as part of Institut Henri Poincaré (IHP) thematic trimester on "Semantics of proofs and certified mathematics".
- 2013 Three-lecture tutorial at Blast'2013, Chapman University.
- 2012 8th International Workshop on Developments in Computational Models (DCM), Corpus Christi College, Cambridge, 17 June 2012.
- 2012 Special session "Computability on Continuous Data" of MFPS (Mathematical Foundations of Programming Semantics), Bath, Friday 8th June 2012.
- 2012 TutorialFest at POPL, Philadelphia, 28 January 2012.
- 2011 Tutorial at MFPS (proofs from programs), Carnegie Mellon University, Pittsburgh 25-28 May 2011.
- 2010 MFPS (Mathematical Foundations of Programming Semantics) tutorial on Programs from Proofs, together with Ulrich Berger, Paulo Oliva, and Monika Seisenberger.
- 2010 MFPS (Mathematical Foundations of Programming Semantics) invited talk.
- 2010 MSFP (Mathematically Structured Functional Programming) invited talk.
- 2009 Invited tutorial at conference CCA 2009, August 18-22, Ljubljana, Slovenia.
- 2008 Plenary lecture at conference CCA 2008, August 21-24, Hagen, Germany.
- 2008 Plenary Workshop Lectures of the Special Session of Applied Topology of the 23rd Summer Conference on Topology and Its Applications, to take place in Mexico City from the 29th of July until the 1st of August 2008.
- 2007 Tutorial at 3rd Workshop on Formal Topology, Padua 8-12 May, invited by Thierry Coquand, Giovanni Sambin, and Peter Schuster.

- 2007 Plenary lecture at Wollic'07 (Workshop on Logic, Language, Information and Computation), Rio de Janeiro 2-5 July, invited by Daniel Leivant.
- 2007 Lecture at joint session of LICS 2007 (22nd Annual IEEE Symposium on Logic in Computer Science) and Logic Colloquium 2007 (ASL European Summer Meeting).
- 2007 Lecture at combined workshops Domains VIII and Computability over continuous data types. Novosibirsk, 11-15 September 2007.
- 2006 Plenary lecture at Summer Conference on Topology and its Applications, Georgia Southern University (Statesboro, GA) July 6-9.
- 2006 Plenary lecture at CSL 2006 conference (European Association for Computer Science Logic), 25 - 29 September, University of Szeged, Hungary.
- 2006 Plenary lecture at Workshop Modal Logic, Stone Duality and Coalgebras, 12-13 June 2006, Leicester University.
- 2005 Tutorial at Satellite Seminar of conference Computability and Complexity in Analysis (CCA), August 25-29, Kyoto, Japan.
- 2005 Plenary lecture at Small TYPES workshop Constructive analysis, types and exact real numbers. Nijmegen, the Netherlands, 3-4 October.
- 2003 Plenary lecture at Workshop on Domains, Topology and Constructive Logic, November 1-2, organized by Dana Scott and Helmut Schwichtenberg, Mathematisches Institut, LMU, Munich.
- 2003 Special session on domain theory of the conference MFPS XIX (mathematical foundations of programming semantics), Montréal, Canada March 19 - March 22.  
<http://www.math.tulane.edu/~mfps/mfps19.htm>
- 2002 Workshop on Domain Theory in Honour of Dana S. Scott's 70th birthday, July 20-21, 2002, Affiliated with FLoC'02, invited by Lars Birkedal and Giuseppe Rosolini.  
<http://www.it-c.dk/research/theory/scott-fest-2002/>
- 2002 Plenary lecture at the Second Workshop on Formal Topology, Auditorium S. Margherita, Campo S. Margherita, Venice, April 4-6, 2002. Invited by Per Martin-Löf and Giovanni Sambin.
- 2001 Plenary lecture at the International Conference on Applicable General Topology, Ankara, August 12-18, 2001.  
<http://www.mat.hacettepe.edu.tr/topconf/main.html>
- 2000 Tutorial at the International Symposium on Symbolic and Algebraic Computation (ISAAC), 6th-9th August, St. Andrews, Scotland, invited by Josef Schicho.  
<http://www-gap.dcs.st-and.ac.uk/issac2000/>

- 1999 Plenary lecturer at 5th Northeastern Conference on Topological Methods in Computer Science, April 10, University of Connecticut at Stamford, Stamford, CT. Organized by V. G. Menon, R. C. Flagg, and R. Kopperman.  
<http://www.sp.uconn.edu/~menon/conf.html>
- 1998 LICS98 preworkshop “Real Number Computation”, Indiana, USA. Organized by A. Edalat, A. Jung, D.S. Scott, and Ph. Sünderhauf.  
<http://theory.doc.ic.ac.uk/~ps15/ws/>
- 1998 Plenary Lecturer at the 3rd Real Numbers and Computers Conference (RNC3), l’Université Pierre et Marrie Curie, Paris. Organized by J.-M. Chesneaux, F. Jézéquel, J.-L. Lamote, and J. Vignes.  
<http://www-anp.lip6.fr/RNC3/>
- 1997 Mathfit Summer School on New Paradigms for Computation on Classical Spaces, University of Birmingham. Organized by A. Edalat, A. Jung, and K. Keimel.  
[http://www.cs.bham.ac.uk/~axj/comprox\\_summer\\_school.html](http://www.cs.bham.ac.uk/~axj/comprox_summer_school.html)

I’ve also been invited to take part of a number of Dagstuhl seminars, and a many special sessions on computer science in topology conferences.

#### **Programme chair**

- 2011 Domains IX (co-chair) with Ulrich Berger, Swansea.
- 2005 MFPS XXI (Mathematical Foundations of Programing semantics), organized by S. Brooks, A. Jung, C. Medows, M. Mislove, P. Panangaden.

#### **Conference chair**

- 2010 LICS.

#### **Conference treasurer**

- 2011 LICS.

#### **Programme committee membership**

- 2023 CSL, Calco.
- 2022 LICS.
- 2021 TyDe.
- 2019 ISDT, 6WFT.
- 2018 CCC, Domains XIII.

- 2015 Wollic, Calco, TLCA, Domains.
- 2014 CL&C, MFPS.
- 2012 LICS, CCA, MSFP, MFPS.
- 2011 Domains X (Co-chair).
- 2010 LICS, CCA.
- 2008 Domains IX, LICS, Wollic, RNC8, MFPS.
- 2007 CCA (Computability and complexity in analysis), Siena, July 16-20.
- 2006 MFPS XXII (Mathematical Foundations of Programing semantics), University of Genova, Italy May 24 - May 27.
- 2006 RNC7 (Real Numbers and Computers conference). LORIA, Nancy, France July 10.
- 2005 CSL'05 (14th Annual Conference of the European Association for Computer Science Logic), Oxford.
- 2004 RNC6 (Real Numbers and Computers conference), 15-17 November, Dagstuhl, Germany.
- 2003 RNC5 (Real Numbers and Computers), September 3-5, Ecole Normale Supérieure de Lyon, France.
- 2003 CCA (10th conference on Computability and Complexity in Analysis, August 28-30, Cincinnati, USA.  
<http://www.informatik.fernuni-hagen.de/cca/cca2003/>
- 2003 MFPS XIX (conference on Mathematical Foundations of Programming Semantics), Montréal, Canada March 19 - March 22.  
<http://www.math.tulane.edu/~mfps/mfps19.htm>
- 2000 RNC4 (Real Numbers and Computers) held in Dagstuhl, Saar, Germany in April 17-19, organized by Peter Kornerup.  
<http://www.imada.sdu.dk/~kornerup/RNC4/CFP.html>
- 1999 CTCS'99 (8th conference on Category Theory and Computer Science), 10-12 September, Edinburgh, Scotland. Organized by S. Abramsky, P. Dybjer, E. Moggi, and A. Pitts.  
<http://www.dcs.ed.ac.uk/home/ctcs99/>
- 1998 RNC3 (Real Numbers and Computers), l'Université Pierre et Marrie Curie, Paris. Organized by J.-M. Chesneaux, F. Jézéquel, J.-L. Lamote, and J. Vignes.  
<http://www-anp.lip6.fr/RNC3/>

### Organization of international meetings

- 2023 Lead co-organizer of MGS (Midlands Graduate School on the foundations of computing science). This year the School attracted 120 students from all over the world, with 10 participants from industry. It was sponsored by Huawei and Standard Chartered. <https://www.cs.bham.ac.uk/~mhe/events/MGS23/>.
- 2022 Co-organizer and lecturer of the HoTTEST Summer School [https://www.uwo.ca/math/faculty/kapulkin/seminars/hotttest\\_summer\\_school\\_2022.html](https://www.uwo.ca/math/faculty/kapulkin/seminars/hotttest_summer_school_2022.html) to on Homotopy Type Theory to take place in July-August 2022 online. So far 992 students have registered.
- 2019 6th Workshop on Formal Topology, with Steve Vickers.
- 2018 Dagstuhl seminar Formalization of Mathematics in Type Theory, with Andrej Bauer, Peter Lumsdaine, Assia Mahboubi.
- 2018 Workshop Domains in honour of Dana Scott 85th birthday, associated to FLoC. With Andrej Bauer.
- 2017 UniMath School, with Benedikt Ahrens, Achim Jung, Chris Kapulkin, Vladimir Voevodsky.
- 2009 New Interactions between Analysis, Topology and Computing. University of Birmingham, 7-9 January 2009, Supported by Royal Society and NSF of South Africa, together with Achim Jung.
- 2005 MFPS XXI conference, Birmingham, 18–21 May 2005, together with Achim Jung and Steve Vickers.  
<http://www.math.tulane.edu/~mfps/mfps21.html>  
<http://events.cs.bham.ac.uk/mfps21/>
- 2002 Domains VI workshop, Birmingham, 16–19 Sept 2002, together with Achim Jung.  
<http://www.cs.bham.ac.uk/~wd6/>

### Academic visits

- 2023 CIRM (Centre International de Rencontres Mathématiques).
- 2019 Center for Advanced Studies, Norway, invited by Marc Bezem and Bjorn Dundas.
- 2018 Hausdorff Institute, “Types, Sets and Constructions”, invited by Douglas S. Bridges, Michael Rathjen, Peter Schuster, Helmut Schwichtenberg.
- 2017 New Institute, Big Proof.
- 2016 Bergen University, invited by Marc Bezem.

- 2016 Stockholm University, invited by Erik Palmgren.
- 2016 Charles University, Prague, invited by Ales Pultr.
- 2016 Max Planck Institute for Mathematics, Bonn, HoTT workshop.
- 2014 Institute Henri Poincare (IHP), Paris, Semantics of proofs and certified mathematics Programme, one-month invited Professorship.
- 2013 Institute for Advanced Studies (IAS), Princeton, Univalent Foundations Programme, one-week visit.
- 2012 Newton Institute, one-month visit.
- 2005 One-month Visiting Professorship at Paris 7, Equipe PPS, June. Invited by Pierre-Louis Curien and Vincent Danos.
- 2002 One-week visit to BRICS Aarhus, 1-6 Feb. Invited by Margarita Korovina.
- 2001 One-month Visiting Professorship at the École Normale Supérieure, Paris, 15th June to 15th July, invited by Giuseppe Longo.
- 2000 One-week visit to Risc-Linz, Austria, February, invited by Josef Schicho.
- 2000 One-month Visiting Professorship at the École Normale Supérieure, Paris, 5th January to 5th February. Invited by Giuseppe Longo.
- 1998 One-month visit to Pontifícia Universidade Católica do Rio Grande do Sul (PUC-RS), Department of Mathematics. Invited by Dalcidio Moares Claudio.
- 1997 One-week visit to Carnegie Mellon University, Department of Computer Science. Invited by Dana Scott.
- 1995–97 Four one/two-week visits under a joint ARC/DAD grant “A Computational Approach to Integration and Measure Theory”, Technische Hochschule Darmstadt, Department of Mathematics. Invited by Klaus Keimel.

### **Grants**

- 2009 Royal Society South Africa-UK Science Networks.
- 2005 Security Tutorial Day at MFPS XXI, EPSRC grant EP/D029643, £1765, with Achim Jung.
- 2002-2005 Participant of Appsem grant II, Birmingham site. Funds conferences and visits between sites.
- 2002 *Workshop Domains VI*, EPSRC grant GR/S11756/01, £5,074, with Achim Jung.



- 1999 *Parallel Features in Scott's Interval Domain Approach to Exact Real Number Computation*, funded by EPSRC, principal investigator, visiting fellowship for Prof. Thomas Streicher, Darmstadt, to do research in Edinburgh University.
- 1999-01 *Exact arithmetic and computer algebra systems* with Dr. Tom Kelsey and Prof. Ursula Martin, funded by EPSRC 1999-2001, St Andrews University, co-investigator. Employed a research assistant for two years,
- 1999-2001 Participant of European Appsem grant I, Edinburgh site. Funded conferences and visits between sites.
- 1996-1999 *Programming Languages for Exact Real Number Computation: Theory and Implementation*. Funded by EPSRC. It started 1st May 1996 for 3 years with 2 RA's and a budget of £317,500. Prof. Abbas Edalat and Chris Hankin were the investigators, and I wrote the application with him and J. Muijlaert-Filho, and I was one of the nominated and employed RA's.
- 1995-1997 Participant of grant *An Effective Approach to Measure Theory, Image Compression, and Statistical Physics*. Funded by the British Council under the ARC scheme. Participating organisations: Imperial College, Technische Hochschule Darmstadt, Universität Leipzig, Universität des Saarlandes, University of Birmingham.

### Refereeing

I am (too) often asked to referee papers for international journals and conferences, both in computer science and mathematics. I have also been asked to review grant and fellowship applications (UK, Canada and South Africa).

### Organization of seminars

1. *Theory Lab Lunch*, School of Computer Science, University of Birmingham.
2. *Informal real-number computation seminar*, School of Computer Science, University of Birmingham, together with Achim Jung.
3. *Topology and computer science seminar*, School of Computer Science, University of Birmingham, together with Ralph Kopperman, Achim Jung, Chris Good and Steve Vickers.
4. *Theory seminar*, School of Computer Science, University of Birmingham.

### PhD students

- 1999 Frédéric De Jaeger, École Normale Supérieure, University of Paris 7. Successfully defended thesis "*Calculabilité sue les réels*" in 2003. Giuseppe Longo was the director (supervisor) and I was the co-director.

- 2001 J. Raymundo Marcial-Romero, University of Birmingham, UK. Successfully defended his thesis in December 2004, "*Semantics of a sequential language for real-number computation*".
- 2003 W.K. Ho, university of Birmingham, UK. Successfully defended his thesis in October 2006.
- 2003 Thomas Anberree. Successfully defended his thesis in December 2007.
- 2012 Chuangjie Xu. Successfully defended his thesis in May 2015.
- 2014 Cory Knapp. Successfully defended his thesis in 2018.
- 2015 Auke Booij. Successfully defended his thesis in 2019.
- 2018 Tom De Jong. Successfully defended his thesis in 2022.
- 2019 Todd Ambridge.
- 2020 Ayberk Tosun.
- 2022 Andrew Sneap.

**External examination**

- 2017-2020 MFoCS master degree, member of Advisory Board, Oxford University.
- 2013-2016 MFoCS master degree external examiner, Oxford University.

**External PhD student examination**

- 2023 Christina Matache. Oxford. Supervisor Sam Staton.
- 2022 Konstantinos Tsamis. University of Patras. Supervisor Panagis Karazeris.
- 2020 Louis Warren. University of Canterbury. Supervisor Hannes Diener.
- 2019 University of Coimbra. Willian Ribeiro Valencia da Silva. Supervisor Maria Manuel Clementino.
- 2019 Aston University. Eike Neumann. Supervisor Michal Konecny.
- 2017 Tallin University of Technology. Niccolo Veltri, Supervisor Tarmo Uustalu.
- 2016 Mines Nantes. Kevin Quirin. Supervisor Nicolas Tabareau.
- 2016 Bergen University. Erik Parmann. Supervisor Marc Bezem.
- 2015 Macquarie University. Matthew Burke. Supervisor Richard Garner.
- 2013 Leeds University. Matthew Hendtlass. Supervisors Michael Rathjen and Peter Schuster.

- 2012 Cambridge University. Arno Pauly. Supervisor Anuj Dawar.
- 2010 University of Ljubljana, Slovenia. Davorin Lesnik. Supervisor Prof. Andrej Bauer.
- 2009 Universidad de Alicante, Spain. Gregorio de Miguel Casado. Supervisor Prof. Juan Manuel García Chamizo
- 2006 BRICS, Aarhus. Branimir Lambov. Supervisor Prof. Ulrich Kohlenbach). 31st March 2006.
- 2003 École Normale Supérieure de Paris. Member of jury of Frédéric De Jaeger. Supervisor Prof. Giuseppe Longo).
- 2003 Manchester University. Rosemary A. Sexton. Supervisor Harold Simmons.

#### **Internal PhD student examination.**

Incomplete.

- 2002 Pawel Waszkiewicz, supervised by Achim Jung, University of Birmingham, 15th July.
- 2004 Amin Farjudian, supervised by Achim Jung, University of Birmingham, 11th Aug.
- 2014 Guillaume Raynaud, supervised by Steve Vickers.
- 2018 Nishantan Kamaleson, supervised by David Parker.
- 2018 Xiaodong Xia, supervised by Achim Jung.
- 2019 Sina Hazratpour, supervised by Steve Vickers.
- 2021 Ana Laura Suarez, supervised by Achim Jung.

#### **Publications.**

See

<http://www.cs.bham.ac.uk/mhe/papers/index.html>

#### **Talks.**

See

<http://www.cs.bham.ac.uk/mhe/talks.html>