

Marc Masdeu

Interested in *effective methods* for **Number Theory** and **Arithmetic Geometry**

Specifically, automorphic forms and their L-functions, non-archimedean overconvergent methods, algebraic points on abelian varieties.

Positions

- July 22 – present** Professor Titular interí; **Universitat Autònoma de Barcelona**. Bellaterra, Catalunya.
- Mar 17 – July 22** Investigador Ramon y Cajal; **Universitat Autònoma de Barcelona**. Bellaterra, Catalunya.
- Sept 15 – Feb 17** Marie Skłodowska-Curie Fellow; **University of Warwick**. Coventry, United Kingdom
- Jan 14 – Aug 15** Research Associate; **University of Warwick**. Coventry, United Kingdom
- Jul 10 – Dec 13** Ritt Assistant Professor; **Columbia University**. New York, United States

Education

- Sep 07 – May 10** **PhD, Mathematics**; McGill University.
Thesis: *CM-cycles on varieties fibered over Shimura curves, and p -adic L-functions*
- Aug 05 – Aug 07** **M.S. in Pure Mathematics**; U. of Illinois at Urbana–Champaign.
- Sep 99 – Jul 05** **Telecommunication Engineering**; U. Politècnica de Catalunya. *Rank 5th of 290.*
Essay: *Elliptic Curve Cryptography: A software perspective*
- Sep 99 – May 04** **Mathematics “Llicenciatura”**; U. Politècnica de Catalunya. *Rank 3rd of 40.*

Awards

- 2016** Beca Ramon y Cajal
- 2015** Marie Skłodowska-Curie Fellowship, with Samir Siksek (Warwick).
- 2008 & 2009** Schulich Graduate Fellowship
- 2008** Institut des Sciences Mathématiques. Graduate Fellowship
- 2004** La Caixa Fellowship

Publications

1. **Plectic p-adic invariants**
Advances in Mathematics, Volume 406 (2022). With M. Fornea and X. Guitart.
2. **A quaternionic construction of p-adic singular moduli**
Research in the Mathematical Sciences, Volume 8 (2021). With X. Guitart and X. Xarles.
3. **Special values of triple-product p-adic L-functions and non-crystalline diagonal classes**
J. Th. Nombres Bordeaux (Iwasawa 2019 special issue). With F. Gatti, X. Guitart and V. Rotger.
4. **An automorphic approach to Darmon points**
Indiana Univ. Math. J. Volume 69 (2020), no. 4, 1251–1274. With X. Guitart and S. Molina.
5. **Computing p-adic periods of abelian varieties from automorphic forms**
Automorphic forms and related topics (2019), 75–83, Contemp. Math., 732, AMS. With X. Guitart.
6. **Periods of modular GL₂-type abelian varieties and p-adic integration**
Experimental Mathematics (2018), Volume 27, issue 3, pp 344–361. With X. Guitart.
7. Appendix to **On Heegner Points for primes of additive reduction ramifying in the base field**
Trans. Amer. Math. Soc., Volume 370 (2018), pp. 911–926. With D. Kohen and A. Pacetti.
8. **Uniformization of modular elliptic curves via p-adic periods**
Journal of Algebra Vol. 445 (2016), pp. 458–502. With X. Guitart and M.H. Sengun.
9. **Dirac operators in tensor categories and the motive of quaternionic modular forms**
Advances in Mathematics, Vol. 313, 20 June 2017, pp. 628–688. With M. Seveso.
10. **Poincaré duality isomorphisms in tensor categories**
Journal of Pure and Applied Algebra, Vol. 222 (2017), Issue 10, October 2018, pp. 3075–3123.
With M. Seveso.
11. **Darmon points on elliptic curves over number fields of arbitrary signature**
Proceedings of the LMS Vol. 111 (2015), pp. 484–518. With X. Guitart and M.H. Sengun.
12. **A p-adic construction of ATR points on Q-curves**
Publicacions Matemàtiques Vol. 59 (2015), pp. 511–545. With X. Guitart.
13. **Overconvergent cohomology and quaternionic Darmon points**
J. Lond. Math. Soc. Vol. 90 (2014), no. 2, pp. 495–524. With X. Guitart.
14. **Elementary matrix decomposition and the computation of Darmon points with higher conductor**
Mathematics of Computation. Vol. 84 (2015), N. 292, pp. 875–893. With X. Guitart.
15. **Computing fundamental domains for the Bruhat–Tits tree for GL₂(Q_p), p-adic automorphic forms, and the canonical embedding of Shimura curves**

LMS Journal of Computation and Mathematics. Vol. 17, issue 01, pp. 1–23, 2014. With C. Franc.

16. **Computation of ATR Darmon points on non-geometrically modular elliptic curves**

Experimental Mathematics. Vol. 22, pp. 85–98, 2013. With X. Guitart.

17. **Continued fractions in 2-stage euclidean quadratic fields**

Mathematics of Computation. Vol. 82, N. 282, April 2013, pp. 1223–1233. With X. Guitart.

18. **CM cycles on Shimura curves, and p-adic L-functions**

Compositio Mathematica. Vol. 148, issue 04, pp. 1003–1032, July 2012.

19. **Bézout domains and elliptic curves**

Comm. in Algebra. Vol. 36, No. 12., pp. 4492–4499, December 2008. With I. Goldbring.

20. **A note on dihedral polynomials of prime degree**

Indian J. Pure Appl. Math. Vol. 36(6), pp. 295–300, June 2005. With J.-C. Lario.

Research Supervision

2022

Valentina Gallardo: TFG on **Criptografia basada en isogènies supersingulars**.

Alejandro Tomé: TFG on **Teoria de mòduls singulars**.

Martí Pons: TFG on **Teorema de Separació de Conjunts Borrosos Convexos**.

2020

Eloi Torrents: TFM on **Understanding the factorization mod p of polynomials via modular forms**.

Àlex Padrós: TFG on **Construcció de funcions-L p -àdiques**.

Alba Garcia: TFG on **Funcions theta i el teorema dels quatre quadrats de Jacobi**.

2019

Dídac Gil: TFG on **When is the product of eigenforms an eigenform?**.

Josep Maria Mateu: TFG on **Torsion points of elliptic curves over number fields**.

Alex Abregú: TFG on **Isogenies on post-quantum cryptography**.

2018

Sergi Burniol: TFG on **Calculating the Selmer group of families of elliptic curves**.

2016

Jun Bo Lau: URSS on **Cohomology of congruence subgroups of $SL(3, \mathbb{Z})$** .

Mayur Dave: URSS on **Computing Bianchi Modular forms**.

Matthew Shaw: **Fourth-year** essay on **p-adic Analysis and Zeta Functions**.

Mayur Dave: **Third-year** essay on **Complex Multiplication**.

2015

Pip Goodman: URSS on **Homology via Shapiro's Lemma**.

Daniel Olivares: **Third-year** essay on the **Prime Number Theorem**.

- 2013 Supervisor: *Undergrad. Summer Res.* on **Pairing-based Crypto** (w/ M. Woodbury).
- 2012 *Adrien Brochard*: on a project to implement splitting fields in *Sage*.
Nathan Booth (Rabi Scholar): on a research project on matrix decompositions.

Teaching Experience

- **Instructor (Universitat Autònoma de Barcelona)**. Fall 2017 - present.
- **Instructor (University of Warwick)** for *Modular Forms*. Fall 2014, Fall 2015
- **Assistant (University of Warwick)** for *Maths in Action*. Spring 2015.
- **Instructor (Columbia University)** for *Introduction to Modern Analysis*. Summer 2012.
- **Instructor (Columbia University)** for *Linear Algebra*. Spring 2012, Spring 2013, Fall 2013.
- **Instructor (Columbia University)** for *Calculus 1 and 2*. Fall 2010, Spring 2011, Fall 2011, Fall 2012.
- **Marker (McGill University)** for *Higher Algebra* (graduate course). Fall 2009.
- **Teaching Assistant (McGill University)** for *Math 141* (Calculus). Fall 2007, Winter 2008, Winter 2009.

Teaching Formation

- **Reviewing and Evaluating Your Teaching (University of Warwick)**: Explore the different purposes for reviewing and evaluating one's own teaching (Jan 2015).
- **T-PULSE Workshop (McGill University)**: Improving teaching skills in science (Sept 2008).

Service & Organization

- **Barcelona LEAN Seminar**
Co-organizer (with N. Castellana, E. Torrents, E. Vilalta, S. Borrós) a running weekly seminar on formalizing mathematics in **LEAN**.
- **PhD defence committee member**
For Víctor Hernández, *p-adic L-functions, p-adic Gross-Zagier formulas and plectic points*. Supervisors: Santiago Molina, Victor Rotger. UPC, Barcelona, April 2022.
- **Barcelona Mathematical Days**
Co-organizer (with A. Delshams, J. Vives and N. Fuster) of the triennial conference of the **Societat Catalana de Matemàtiques**. October 23-24, 2020.
- **GAP – PARI – Sage Days 93**
Co-organizer (with V. Delecroix) of a workshop on *Subgroups and lattices of Lie groups*. **Faber Residency**, Olot (Catalunya), February 19 – March 4th, 2018.
- **Sage Days 84**
Co-organizer (with V. Delecroix) of Sage Days on *Polytopes (in Sage, Python, polymake and more)*. **Faber Residency**, Olot (Catalunya), February 27 – March 10th, 2017.
- **PhD defence committee member**
For Piermarco Milione, *Shimura curves and their p-adic uniformizations*. Supervisor: Pilar Bayer. UB, Barcelona, January 2016.
- **Number Theory Seminar**
Organizer of the Warwick Number Theory Seminar, academic year 2015 – 2016.

- **Arithmetic of Euler Systems**
Co-organizer (with X. Guitart, D. Loeffler, S. Zerbes). Benasque (Spain), Aug 22 – 30, 2015.
- **PhD defence committee member**
For Carlos de Vera, *Rational points on Shimura curves and Galois representations*. Supervisor: Victor Rotger. UPC, Barcelona, November 2014.
- **Effective methods for Darmon points**
Co-organizer (with F. Fité, X. Guitart, J.-C. Lario and V. Rotger). Benasque (Spain), Aug 26 – 30, 2013.
- **Oral Exam committee member**
Vladislav Petkov, *Automorphic Forms and Representations*. Columbia University, March 2013.
- **Sato–Tate in Higher dimension**
Co-organizer (with X. Guitart and J.-C. Lario). Benasque (Spain), Jul 25 – Aug 06, 2011.
- **Oral Exam committee member**
Carlos de Vera, *Rational points on Atkin–Lehner quotients of Shimura curves*. UPC, May 2012.
- **Member, Committee for Graduate Affairs, Mathematics and Statistics**
McGill University, September 2009 – August 2010.
- **Member, Reviewing Board, Delta–Epsilon Magazine**
McGill University, September 2009 – August 2010.
- **Member, Computer and Equipment Committee, Mathematics and Statistics**
McGill University, September 2008 – August 2009.
- **Volunteer, Number Theory Fest**
University of Illinois at Urbana–Champaign, May 2007.

Research Stays

August 2018	Mathematisches Forschungsinstitut Oberwolfach (Germany)
Jun–Jul 2011	Max Planck Institute for Mathematics (Bonn, Germany)
May–Jun 2008	Università di Padova (Padova, Italy)
Sept–Dec 2004	Institut Henri Poincaré (Paris, France)
Jun–Sept 2002	University of California at Irvine (Irvine, USA)

Contributed Talks

June 2022	<i>9es Jornades de Teoria de Nombres</i> . Logroño , Spain. April 2022 <i>Greek Algebra and Number Theory Seminar</i> . ONLINE .
April 2022	<i>Laval Algebra and Number Theory Seminar</i> . ONLINE .
February 2022	<i>Heidelberg Number Theory Seminar</i> . ONLINE .
April 2021	<i>LFANT Seminar</i> . ONLINE .
February 2021	<i>Real Academia de las Ciencias</i> . ONLINE .
January 2021	<i>Online Research Group Seminar, Groningen</i> . ONLINE .

- December 2020** *Canadian Math Society Winter Meeting.* **ONLINE.**
- September 2020** *Seminario Latinoamericano de Teoría de Números.* **ONLINE.**
- January 2019** *Seminari de Teoria de Nombres de Barcelona.* **Universitat de Barcelona**, Barcelona, Catalunya.
- October 2018** *Automorphic Techniques in Arithmetic Geometry.* **Humboldt University**, Berlin, Germany.
- Sept 2017** *IV Congreso de Jóvenes Investigadores RSME.* **València**, Spain. Plenary speaker.
- July 2017** *Sage Days 87: p -adic numbers.* **University of Vermont**, Burlington, VT.
- July 2017** *Automorphic Motives, Euler Systems & p -adic L-functions.* **Nisyros**, Grece.
- Jun 2017** *Workshop Arithmetic Geometry and Computer Algebra.* **Oldenburg University**, Oldenburg, Germany.
- Jun 2017** *Meeting of the Catalan, Spanish, Swedish Math Societies.* **Linköping University**, Umeå, Sweden.
- May 2017** *Number Theory Seminar.* **Heidelberg University**, Heidelberg, Germany.
- Nov 2016** *Number Theory Seminar.* **Nottingham University**, Nottingham, UK.
- Sept 2016** *Automorphic Forms: Theory and Computation.* **King's College**, London, UK.
- July 2016** *Automorphic Forms and Related Topics.* **Sarajevo**, Bosnia and Herzegovina.
- Sept 2015** *Modular forms & curves of low genus: computational aspects.* **ICERM**, Providence, RI.
- Sept 2015** *II Congreso de Jóvenes Investigadores RSME.* **Múrcia**, Spain.
- May 2015** *Number Theory Study Group.* **University of York**, York.
- Feb 2015** *London Number Theory Seminar.* **University College London**, London.
- Dec 2014** *Number Theory Seminar.* **Sheffield University**, Sheffield.
- Dec 2014** *Number Theory Seminar.* **Bristol University**, Bristol.
- Oct 2014** *p -adic Methods in Number Theory.* **Dip. Matematica "Federigo Enriques"**, Milano.
- Jul 2014** *Number Theory Seminar.* **Universität of Duisburg–Essen**, Essen.
- Jul 2014** *Automorphic Forms and Related Topics.* **Bristol University**, Bristol.
- Jul 2014** *First Joint International Meeting.* **Euskal Herriko Unibertsitateko**, Bilbao.
- May 2014** *Number Theory Seminar.* **Cambridge University**, Cambridge.

Jan 2014	<i>Number Theory Seminar.</i> University of Warwick , Coventry.
Dec 2013	<i>Canadian Math. Soc. Winter Meeting.</i> Ottawa .
Aug 2013	<i>Effective Methods for Darmon points.</i> Centro de Ciências Pedro Pascual . Benasque.
Jun 2013	<i>MEGA Conference.</i> Goethe Universität , Frankfurt.
Feb 2013	<i>Sage Days 44.</i> University of Wisconsin , Madison.
Nov 2012	<i>Automorphic Forms and Arithmetic.</i> Columbia University , New York.
May 2012	<i>Barcelona–Boston–Tokyo Number Theory.</i> Univ. Politècnica de Catalunya , Barcelona.
Feb 2012	<i>Number Theory Seminar.</i> Université Laval , Québec.
Sept 2011	<i>Collaborative Number Theory Seminar.</i> City University of New York , New York.
Jul 2011	<i>Oberseminar.</i> Max-Planck-Institut für Mathematik , Bonn.
Feb 2010	<i>Magma Conference: p-adic L-functions.</i> C. Recherches Mathématiques , Montréal.
Dec 2009	<i>Algebraic Cycles, Modular Forms, and Rational Points.</i> C. Recerca Matemàtica , Barcelona.
Sep 2004	<i>Sa Conjectura de Catalan.</i> Menorca .

Other Information

- **Refereeing**
 - For *Compositio Mathematica*, *IMRN*, *Journal of the LMS*, *Journal of Algebra*, *International Journal of Number Theory*, *Journal of Number Theory*, *Mathematics of Computation*, *Acta Arithmetica*, *Ann. Math. Quebec*.
 - Contributor to *Mathematical Reviews (MR)*.
- **Outreach**
 - **STEMnet Ambassador** . Promoting Science, Technology, Engineering and Mathematics to students in UK (April 2015 – March 2017).
 - **Code Club** at *Clinton Primary*, introducing pupils (Years 5, 6) to computer programming (Jan 2015 – December 2016).
- **Languages**
 - **Catalan** and **Spanish** as native languages, proficient in **English** and **French**.
- **Computer skills**
 - Advanced GNU–Linux user/admin.
 - Mathematics-oriented languages (Sage, Pari, Magma, Maple), and generic (Python, C/C++, Java).
- **Age and Citizenship**
 - Born November 1st, 1981, in Barcelona. Spanish passport holder.