

Francesc Castella

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Academic Positions

2022–present Associate Professor, **University of California, Santa Barbara**
2018–2022 Assistant Professor, **University of California, Santa Barbara**
2017–2019 Instructor, **Princeton University**
2016–2017 Associate Research Scholar, **Princeton University**
2013–2016 Hedrick Assistant Professor, **University of California, Los Angeles**

Visiting Positions

Sept 2023 Professeur Invité, **Université Sorbonne Paris Nord**
Spring 2023 Research Member, **MSRI/SLMath**

University Degrees

2013 Ph.D. in Mathematics, **McGill University**
(advisor: Prof. Henri Darmon)
2009 M.Sc. in Mathematics, **BarcelonaTech**
2008 B.Sc. in Mathematics, **BarcelonaTech**

Awards and Honors

2024 AMS Centennial Fellowship
2023 CRM-ISM-AMQ Prize
2016 Vicent Caselles Award, FBBVA-Royal Spanish Mathematical Society
2016 Distinguished Teaching Award, UCLA
2008 Évariste Galois Prize, Institut d'Estudis Catalans

Fellowships and Grants

2021–2024 PI, NSF Grant DMS-2101458
2018–2021 PI, NSF Grant DMS-1801385, DMS-1946136
2016–2018 AMS-Simons Travel Grant

Publications

21. **Perrin-Riou's main conjecture for elliptic curves at supersingular primes.**
(joint with X. Wan), *Mathematische Annalen*, to appear.
20. **An anticyclotomic Euler system for adjoint modular Galois representations.**
(joint with R. Alonso and O. Rivero), *Annales de l'Institut Fourier*, to appear.

19. **The diagonal cycle Euler system for $GL_2 \times GL_2$.**
(joint with R. Alonso and O. Rivero), *Journal de l'Institut Mathématique de Jussieu*, to appear.
18. **Iwasawa–Greenberg main conjecture for nonordinary modular forms and Eisenstein congruences on $GU(3, 1)$.**
(joint with Z. Liu and X. Wan), *Forum of Mathematics, Sigma*, **10** (2022), e110, 90 pp.
17. **On the anticyclotomic Iwasawa theory of rational elliptic curves at Eisenstein primes.**
(joint with G. Grossi, J. Lee, and C. Skinner), *Inventiones mathematicae*, **227** (2022), no. 2, 517–580.
16. **Class groups and local indecomposability for non-CM forms**, with an appendix by H. Hida.
(joint with C. Wang-Erickson), *Journal of the European Mathematical Society (JEMS)*, **24** (2022), no. 4, 1103–1160.
15. **The Iwasawa Main Conjectures for GL_2 and derivatives of p -adic L -functions.**
(joint with X. Wan), *Advances in Mathematics*, **400** (2022), 108266, 45 pp.
14. **On the nonvanishing of generalised Kato classes for elliptic curves of rank 2.**
(joint with M.-L. Hsieh), *Forum of Mathematics, Sigma*, **10** (2022), e12, 32 pp.
13. **p^∞ -Selmer groups and rational points on CM elliptic curves.**
(joint with A. Burungale, C. Skinner, and Y. Tian), *Annales Mathématiques du Québec*, Special Issue in honor of Bernadette Perrin-Riou, **46** (2022), no. 2, 325–346.
*Awarded the **CRM-ISM-AMQ 2023 prize**
12. **On anticyclotomic variants of the p -adic Birch–Swinnerton-Dyer conjecture.**
(joint with A. Agboola), *Journal de Théorie des Nombres de Bordeaux*, Iwasawa 2019 Special Issue, **33** (2021), no. 3.1, 629–658.
11. **A proof of Perrin-Riou’s Heegner point main conjecture.**
(joint with A. Burungale and C.-H. Kim), *Algebra & Number Theory*, **15** (2021), no. 7, 1627–1653.
10. **On the p -adic variation of Heegner points.**
Journal de l'Institut Mathématique de Jussieu, **19** (2020), no. 6, 2127–2164.
9. **On the p -part of the Birch–Swinnerton-Dyer formula for multiplicative primes.**
Cambridge Journal of Mathematics, **6** (2018), no. 1, 1–23.
8. **Heegner cycles and p -adic L -functions.**
(with M.-L. Hsieh), *Mathematische Annalen*, **370** (2018), no. 1-2, 567–628.
7. **On the exceptional specializations of big Heegner points.**
Journal de l'Institut Mathématique de Jussieu, **17** (2018), no. 1, 207–240.
6. **p -adic heights of Heegner points and Beilinson–Flach classes.**
Journal of the London Mathematical Society, **96** (2017), no. 1, 156–180.
5. **Variation of anticyclotomic Iwasawa invariants in Hida families.**
(joint with C.-H. Kim and M. Longo), *Algebra & Number Theory*, **11** (2017), no. 10, 2339–2368.
4. **A geometric perspective on p -adic properties of mock modular forms.**
(joint with L. Candelori), *Research in the Mathematical Sciences*, **4:5** (2017), 15 pp.
3. **Big Heegner points and special values of L -series.**
(joint with M. Longo), *Annales Mathématiques du Québec*, Special Issue in honor of Glenn Stevens, **40** (2016), no. 2, 303–324.
2. **p -adic L -functions and Euler systems: a tale in two trilogies.**
(joint with M. Bertolini, H. Darmon, S. Dasgupta, K. Prasanna, and V. Rotger), In: *Automorphic Forms and Galois Representations*, LMS Lecture Note Series, Proceedings of the LMS Durham Symposium 2011, **414** (2014), 52–101.

1. **Heegner cycles and higher weight specializations of big Heegner points.**
Mathematische Annalen, **356** (2013), no. 4, 1247–1282.

Preprints

7. **Nonvanishing of generalised Kato classes and Iwasawa main conjectures.**
submitted for publication, 20pp.
6. **Mazur’s main conjecture at Eisenstein primes.**
(joint with G. Grossi and C. Skinner)
submitted for publication, 33pp.
5. **Diagonal cycles and anticyclotomic Iwasawa theory of modular forms.**
(joint with K. T. Do)
submitted for publication, 50pp.
4. **Generalized Kato classes on CM elliptic curves of rank 2.**
submitted for publication, 26pp.
3. **Derived p -adic heights and the leading coefficient of the Bertolini–Darmon–Prasanna p -adic L -function.**
(joint with C.-Y. Hsu, D. Kundu, Y.-S. Lee, and Z. Liu)
submitted for publication, 33pp.
2. **On the Iwasawa main conjectures for modular forms at non-ordinary primes.**
(joint with M. Çiperiani, C. Skinner, and F. Sprung)
submitted for publication, 33pp.
1. **Non-vanishing of Kolyvagin systems and Iwasawa theory.**
(joint with A. Burungale, G. Grossi, and C. Skinner)
submitted for publication, 30pp.

Invited Talks

- TSIMF Workshop: “Special values of L -functions”, Sanya, China January 2024
- Colloquium, Wayne State University December 2023
- Number Theory Seminar, Wayne State University December 2023
- Southern California Number Theory Day, UC Irvine October 2023
- Université de Lille, Number Theory Seminar September 2023
- Université Sorbonne Paris Nord, Number Theory Seminar (2 lectures) September 2023
- Conference: “Galois Representations and Automorphic Forms”, Bedlewo, Poland August 2023
- Morningside Center of Mathematics, Beijing June 2023
- MSRI/SLMath, Euler Systems Program Research Seminar May 2023
- University of Pittsburgh, Number Theory Seminar April 2023
- KIAS Instructional Workshop: “Iwasawa Theory for Automorphic Forms” (online, 3 lectures) December 2022
- UCLA, Number Theory Seminar November 2022
- The University of Texas at Austin, Number Theory Seminar November 2022
- AMS Sectional Meeting, Special Session: “Iwasawa Theory”, UMass Amherst October 2022

- ICTS Workshop: “Elliptic Curves and Special Values of L -functions” (online, 3 lectures), Bengaluru August 2022
- Joint Columbia-CUNY-NYU Number Theory Seminar April 2022
- The University of British Columbia, Iwasawa theory Virtual Seminar (online) March 2022
- UCLA, Number Theory Seminar January 2022
- University College Dublin, Algebra and Number Theory Seminar (online) December 2021
- Conference: “ L -functions and Iwasawa Theory”, Roscoff, France (online) November 2021
- Caltech, Number Theory Seminar October 2021
- The University of British Columbia, Number Theory Seminar (online) September 2021
- ICTS Workshop: “BSD Conjecture and Related Topics” (online, 4 lectures) August 2021
- Mathematical Congress of the Americas (MCA) 2021, Special Session: “Galois Representations and Automorphic Forms”, Buenos Aires (online) July 2021
- 2020 CMS Summer Meeting, Special Session: “Arithmetic Geometry” (online) June 2021
- 2020 CMS Summer Meeting, Special Session: “Algebraic Number Theory” (online) June 2021
- LATeN, Seminario Latinoamericano de Teoría de Números (online) April 2021
- University of Vienna, Number Theory Seminar (online) March 2021
- Korea Institute for Advanced Study, Special Seminar (2 lectures, online) December 2020
- University of Arizona, Number Theory Seminar (online) October 2020
- MIT, Number Theory Seminar (online) October 2020
- AMS Sectional Meeting, Special Session: “Automorphic Forms and Galois Representations”, University Park (online) October 2020
- Conference: “On the Non-triviality of Arithmetic Invariants and its Applications”, NCTS, Taipei (canceled due to COVID-19) July 2020
- BarcelonaTech, Number Theory Seminar (online) May 2020
- University of Oregon, Number Theory Seminar February 2020
- UCLA, Number Theory Seminar February 2020
- Caltech, Number Theory Seminar January 2020
- Workshop: “Congruence Ideals and p -adic L -functions”, NCTS, Taipei December 2019
- Colloquium, University of Oklahoma November 2019
- Johns Hopkins University, Number Theory Seminar October 2019
- Conference: “Recent Advances in the Arithmetic of Galois Representations”, Genoa July 2019
- Workshop: “Eisenstein Ideal and Iwasawa Theory”, Morningside Center of Mathematics, Beijing June 2019
- AMS Sectional Meeting, Special Session: “Special Values of L -functions and Arithmetic Invariants in Families”, Hartford April 2019
- AMS Sectional Meeting, Special Session: “Advances in Iwasawa Theory”, Honolulu March 2019
- AMS Sectional Meeting, Special Session: “Algebraic Points”, Honolulu March 2019
- Québec-Vermont Number Theory Seminar, Montréal January 2019
- Seminar, Fudan University December 2018
- Colloquium, UC Santa Barbara January 2018

- Colloquium, Rice University December 2017
- Colloquium, Michigan State University November 2017
- Colloquium, UC San Diego November 2017
- Purdue University, Automorphic Forms Seminar November 2017
- Princeton University/IAS Number Theory Seminar, Princeton October 2017
- Conference: “Special Cycles on Shimura Varieties and Iwasawa Theory”, EPFL August 2017
- Workshop: “Euler Systems and Special Values of L -functions”, EPFL (3 lectures) August 2017
- Jornadas de Teoría de Números, Lleida (plenary speaker) June 2017
- Conference: “ p -adic Methods for Galois Representations and Automorphic Forms”, Barcelona February 2017
- Colloquium, UC San Diego January 2017
- Montréal-Toronto Workshop in Number Theory: “Mock Modular Forms and Their Relatives”, Montréal December 2016
- Columbia University, Arithmetic and Automorphic Forms Seminar December 2016
- University of Pennsylvania, Algebra Seminar October 2016
- BIRS Workshop: “New Directions in Iwasawa Theory”, Banff June 2016
- UCSD, Number Theory Seminar May 2016
- Morningside Center of Mathematics, Beijing (2 lectures) March 2016
- Colloquium, University of Arizona January 2016
- Workshop: “Arithmetic of Euler Systems”, Benasque August 2015
- University of Chicago, Number Theory Seminar April 2015
- Northwestern University, Number Theory Seminar April 2015
- Workshop: “ p -adic Methods in the Theory of Classical Automorphic Forms”, Montréal March 2015
- Joint Mathematics Meetings, Special Session: “Selmer Groups”, San Antonio January 2015
- UC Irvine, Number Theory Seminar October 2014
- Columbia University, Arithmetic and Automorphic Forms Seminar September 2014
- ICM Satellite Conference: “Automorphic Forms and Arithmetic”, Pohang August 2014
- p -adic Variation in Number Theory (Glenn Stevens’ 60th), Boston University June 2014
- Caltech, Number Theory Seminar May 2014
- National Taiwan University (3 lectures) February 2014
- IAS Program: “Special Cycles and p -adic L -functions”, Hong-Kong January 2014
- Princeton University, Number Theory Seminar November 2013
- UCLA, Number Theory Seminar October 2013
- Workshop: “Effective Methods for Darmon Points”, Benasque August 2013
- FRG/RTG mini-Conference: “ p -adic Modular Forms, L -functions and Galois Representations”, UCLA May 2013
- The University of Texas at Austin, Number Theory Seminar April 2013
- Workshop: “Iwasawa Theory and p -adic Families of Automorphic Forms”, Kyoto University (4 lectures) April 2013

- 2012 CMS Winter Meeting, Special Session: “Algebraic Number Theory”, Montréal December 2012
- Workshop: “ p -adic Langlands Program: Recent Developments and Applications”, April 2012
Fields Institute, Toronto

Teaching Experience

UCSB

- 2024 Winter · Math 225B: Topics in Number Theory: Introduction to Iwasawa Theory
- 2023 Fall · Math 225A: Topics in Number Theory: Elliptic Curves and Modular Forms
- 2023 Fall · Math 108B: Advanced Linear Algebra
- 2023 Winter · Math 260Q: Seminar in Mathematics: Iwasawa Theory of Elliptic Curves
- 2023 Winter · Math 220B: Modern Algebra II
- 2022 Fall · Math CS 120FN: Number Systems
- 2022 Winter · Math 220B: Modern Algebra II
- 2021 Fall · Math 4A: Linear Algebra with Applications
- 2021 Spring · Math 225C: Topics in Number Theory: Rational Points on Elliptic Curves
- 2021 Winter · Math 225B: Topics in Number Theory: Introduction to Elliptic Curves
- 2021 Winter · Math 111B: Abstract Algebra II
- 2020 Fall · Math 8: Transition to Higher Mathematics
- 2020 Spring · Math 220C: Modern Algebra III
- 2020 Winter · Math 220B: Modern Algebra II
- 2019 Fall · Math 220A: Modern Algebra I

Princeton

- 2019 Spring · MAT 419: Topics in Number Theory: Algebraic Number Theory
- 2018 Fall · MAT 419: Topics in Number Theory: Arithmetic of Elliptic Curves
- 2018 Spring · MAT 202: Linear Algebra with Applications
- 2017 Fall · MAT 511: Class Field Theory
- 2017 Spring · MAT 175: Multivariable Calculus for Economics
- 2016 Fall · MAT 175: Multivariable Calculus for Economics

UCLA

- 2016 Winter · Math 132: Complex Analysis for Applications
- 2015 Fall · Math 33A: Linear Algebra and Applications
- 2015 Fall · Math 132: Complex Analysis for Applications
- 2015 Spring · Math 117: Algebra for Applications
- 2015 Winter · Math 110A: Algebra
- 2015 Winter · Math 31B: Integration and Infinite Series
- 2014 Fall · Math 207A: Topics in Number Theory: Euler Systems and BSD Conjecture
- 2014 Spring · Math 33A: Linear Algebra and Applications
- 2013 Fall · Math 115A: Linear Algebra
- 2013 Fall · Math 31A: Differential and Integral Calculus

Mentoring Experience

UCSB

- 2023 Spring · Matthew Verheul '24. Reading course on Kato's Euler system
- 2023 Spring · Justin Wu '26. Reading course on p -adic Hodge theory
- 2022 Fall · Sarah Mantell *27 and Milo Moses '26. Reading course on Iwasawa theory
- 2022-2023 · Aleix Torres *23 (UPC-CFIS Visiting Student).
Senior thesis: "Greenberg's methods on the Iwasawa theory for elliptic curves"
- 2021 Summer · Neel Murthy '22. Reading course on the work of Dasgupta–Kakde
- 2021 Spring · Neel Murthy '22. Reading course on class field theory
- 2021 Spring · Kyle Hansen *24, Mychelle Parker *24, Zach Wagner *24, Mulun Yin *24.
Reading course on algebraic number theory
- 2020-2021 · Mychelle Parker *24. Reading course on arithmetic of elliptic curves
- 2020 Summer · Dylan Adams '21. Project on codimension two Iwasawa theory
- 2020 Summer · Travis Steele '21. Project on Iwasawa theory of supersingular elliptic curves
- 2020 Spring · Dylan Adams '21. Reading course on homological algebra
- 2020 Winter · Ansuman Barbalai '21. Reading course on p -adic Hodge theory

Princeton

- 2019 Spring · Gary Hu '20. Junior paper: "Towards the 2-converse of Gross–Zagier–Kolyvagin"
- 2019 Spring · Casimir Kothari '20. Junior paper: "Around Goldfeld's conjecture"
- 2019 Spring · Dylan Galt '20. Reading course on the arithmetic of elliptic curves
- 2018 Summer · Gary Hu '20. Reading course on p -adic singular moduli
- 2018 Summer · Cooper Young '20. Reading course on p -adic singular moduli
- 2018 Spring · Murilo Zanarella '19. Junior paper: "Kolyvagin's conjecture for supersingular primes"
- 2018 Spring · Alec Leng '21. Reading course on the arithmetic of elliptic curves
- 2017 Summer · Ishan Levy '19. Reading course on Stark's conjectures and p -adic analogs
- 2017 Summer · Samuel Marks '19. Reading course on Stark's conjectures and p -adic analogs

UCLA

- 2016 Spring · Jaehoon Lee *19. Reading course on Euler Systems
- 2015 Fall · Van Latimer '16. Senior paper: "2-adic modular forms and Maeda's conjecture"
- 2014 Spring · Yishu Gong '16. Junior paper: "Towards a p -adic theory of mock modular forms"
- 2014 Spring · Ziyi Zhuang '15. Senior paper: " p -adic properties of Taylor coefficients of modular forms"
- 2013 Fall · Zuhair Mullath *17. Reading course on Algebraic Geometry

Postdoctoral Mentees

- Raúl Alonso, 2023–present.
- Rusiru Gambheera, 2023–present.
- Kim Tuan Do, 2022–present.
- Syed Waqar Ali Shah, 2022–present.
- Zuhair Mullath, 2021–present.

PhD Students

- Paul-Antoine Seitz, 2023–present.
- Yi-Li Wu, 2023–present.
- Mulun Yin, 2021–present.
- Christine Alar, 2021–present.
- Mychelle Parker, 2021–present.

Professional Service

- Co-organizer (joint with Samit Dasgupta, Eyal Goren, Adrian Iovita, Antonio Lei, Alice Pozzi, Giovanni Rosso, and Jan Vonk) of the conference: “Arithmetic Cycles, Modular Forms, and L -functions” (August 2025).
- Co-organizer, UCSB Seminar on Geometry and Arithmetic (2019–present).
- Project co-leader with Zheng Liu, APAW 2022 Collaborative Research Workshop.
- ANID-Chile grant external reviewer.
- ERC grant external reviewer.
- IRC grant external reviewer.
- NSERC grant external reviewer.
- NSF panelist.
- External reviewer for the Marie Curie COFUND project “WINNINGNormandy”.
- External reviewer for the María de Maeztu post-doctoral call.
- Second reader for the PhD thesis of Raúl Alonso *23 (advisor: Chris Skinner), Princeton University.
- Second reader for the PhD thesis of Kim Tuan Do *22 (advisor: Chris Skinner), Princeton University.
- Co-organizer, Student learning seminar on Iwasawa theory for elliptic curves (Fall 2021).
- Department graduate advisor (2021–present).
- Member, UCSB VAP Hiring Committee (Winter 2022, Winter 2023).
- Member, UCSB Hiring Practices Committee (Winter 2021).
- Organizer, UCSB Mathematics Department Colloquium (Fall 2019).
- Co-organizer, Princeton Mathematics Department Colloquium (Spring 2019).
- Co-organizer, Princeton University/IAS Number Theory Seminar (2018–2019).
- Projects assistant for Christopher Skinner, Arizona Winter School 2018: Iwasawa Theory.
- Second reader for the PhD thesis of Maya Thackeray *20 (advisor: Chris Skinner), Princeton University.
- Second reader for the senior thesis of Murilo Zanarella '19 (advisor: Chris Skinner), Princeton University.
- Second reader for the senior thesis of Matt Tyler '19 (advisor: Manjul Bhargava), Princeton University.
- Reader/examiner for the senior thesis of Miranda Moore '17, Princeton University.
- Co-organizer, UCLA Number Theory Seminar (2013–2016).
- Organizer, UCLA Participating Number Theory Seminar (Fall 2014).

- Referee for: Acta Mathematica Sinica, Advances in Mathematics, Algebra Number Theory, American Journal of Mathematics, Annales de l'Institut Fourier, Annales Mathématiques du Québec, Annali della Scuola Normale Superiore di Pisa, Annals of Mathematics, Cambridge Journal of Mathematics, Canadian Journal of Mathematics, Commentarii Mathematici Helvetici, Compositio Mathematica, Documenta Mathematica, Duke Mathematical Journal, Forum of Mathematics II, Forum Mathematicum, IMRN, Indiana University Mathematics Journal, Inventiones mathematicae, Iwasawa 2017 Proceedings, Journal für die Reine und Angewandte Mathematik, Journal of the EMS, Journal of the Institute of Mathematics of Jussieu, Journal of the LMS, Journal of Number Theory, Kyoto Journal of Mathematics, Manuscripta Mathematica, Mathematical Proceedings of the Cambridge Philosophical Society, Mathematical Research Letters, Mathematika, Mathematische Annalen, Mathematische Zeitschrift, Mémoires de la Société Mathématique de France, Memoirs of the AMS, Proceedings of the AMS, Proceedings of the LMS, Publicacions Matemàtiques, Research in Number Theory, Transactions of the AMS.

Personal

- Birthdate: July 28, 1986
- Spanish citizen and US permanent resident

Last updated: December 2023