

Edgar Costa

Curriculum Vitæ

RESEARCH INTERESTS

Effective methods in **arithmetic geometry**, **arithmetic statistics**, and **number theory**.

APPOINTMENTS AND VISITING POSITIONS

- 2018- **Massachusetts Institute of Technology**, *Research Scientist*.
2015-2018 **Dartmouth College**, *Instructor in Applied and Computational Mathematics*.
Fall 2015 **Institute for Computational and Experimental Research in Mathematics**, *Brown University*.
Postdoctoral Fellow for the semester program: Computational Aspects of the Langlands Program
Jul 2016 **University of New South Wales**, Sydney, Australia.
Fall 2014 Visiting Scholar
Feb 2013

EDUCATION

- 2010-2015 **Courant Institute of Mathematical Sciences**, *New York University*, Ph.D. in Mathematics.
◦ Thesis title: Effective computations of Hasse-Weil zeta functions
◦ Advisor: Yuri Tschinkel
◦ Awarded Kurt Friedrichs Prize for an outstanding dissertation.
2008-10 **Instituto Superior Técnico**, *Universidade de Lisboa*, MSc in Mathematics and Applications.
◦ Master Thesis: Étale Cohomology
◦ Advisors: Pedro Ferreira dos Santos (IST) and Roy Skjelnes (KTH)
Fall 2009 **KTH - Kungliga Tekniska högskolan**, *Erasmus exchange programme*.
2005-08 **Instituto Superior Técnico**, *Universidade de Lisboa*, BSc in Applied Mathematics and Computation.

PUBLICATIONS AND PREPRINTS (by date of completion)

- [11] **Computing Zeta Functions of Cyclic Covers in Large Characteristic**, (*with Vishal Arul, Alex Best, Richard Magner, and Nicholas Triantafillou*).
to appear in ANTS XIII, arXiv:1806.02262
- [10] **Zeta functions of nondegenerate hypersurfaces in toric varieties via controlled reduction in p -adic cohomology**, (*with David Harvey and Kiran Kedlaya*).
to appear in ANTS XIII, arXiv:1806.00368
- [9] **Rigorous computation of the endomorphism ring of a Jacobian**, (*with Nicolas Mascot, Jeroen Sijlsing, and John Voight*).
to appear in Mathematics of Computation, arXiv:1705.09248

- [8] **The Galois structure of the Picard lattice of a family of K3 surfaces**, (with Florian Bouyer, Dino Festi, Chris Nicholls, and McKenzie West).
Mathematical Proceedings. arXiv:1703.02127
- [7] **On the distribution of the Picard ranks of the reductions of a K3 surfaces**, (with Andreas-Stephan Elsenhans and Jörg Jahnel).
submitted. arXiv:1610.07823
- [6] **Traces, High powers and One level density for families of curves over finite fields**, (with Alina Bucur, Chantal David, João Guerreiro and David Lowry-Duda).
Mathematical Proceedings 165(2) (2018), 225-248. arXiv:1610.00164
- [5] **Effective Computations of Hasse–Weil zeta functions**.
Ph.D. thesis
- [4] **Variation of Néron–Severi ranks of reductions of K3 surfaces**, (with Yuri Tschinkel).
Experimental Mathematics 23 (2014), 475-481. arXiv:1405.2265
- [3] **Asymptotic expansions, L-values and a new Quantum Modular Form**, (with Korneel Debaene and João Guerreiro).
The Ramanujan Journal 35 (2014), 141–148. arXiv:1311.3469
- [2] **A search for Wilson primes**, (with Robert Gerbicz and David Harvey).
Mathematics of Computation 83 (2014), 3071–3091. arXiv:1209.3436
- [1] **Faster deterministic integer factorization**, (with David Harvey).
Mathematics of Computation 83 (2014), 339–345. arXiv:1201.2116

GRANTS, AWARDS AND HONORS

- 2016 - 2018 **CompX Faculty Grant by the Neukom Institute**, *co-PI*.
\$27 000 to work on and host the L-Functions and Modular Forms Database (LMFDB)
- 2015 **Kurt Friedrichs Prize**.
This prize is awarded for an outstanding dissertation in mathematics.
- 2010-2015 **Henry M. MacCracken Fellowship**.
PhD fellowship
- 2010-2014 **Fundação para a Ciência e a Tecnologia PhD Scholarship**.
PhD fellowship
- 2008-2010 **Instituto Superior Técnico, science and technology fellowship**.
To manage, improve and develop the information systems of the Mathematics Department
- 2008 **Honors in the Prof. Jaime Campos Ferreira Prize**.
This prize is awarded for outstanding academic merits in the area of Mathematics
- 2006, 07 **Novos Talentos da Matemática, by Calouste Gulbenkian Foundation**.
This prize is awarded to stimulate promising students to pursue research in Mathematics
- 2006, 08, 09 **Universidade de Lisboa academic merits award**.
- 2005 **Prize of Caixa Geral de Depósitos**.
This prize is awarded for academic merits

TALKS

- Oct 2018 **Frobenius Distributions.**
Colóquio de Geometria e Aritmética Rio de Janeiro
- Sep 2018 **Frobenius Distributions.**
Massachusetts Institute of Technology
- June 2018 **Computing zeta functions of nondegenerate hypersurfaces in toric varieties.**
University of Wisconsin, Algorithmic Number Theory Symposium XIII
- May 2018 **Computing zeta functions of nondegenerate toric hypersurfaces.**
Institute for Computational and Experimental Research in Mathematics, Birational Geometry and Arithmetic
- Dec 2017 **Computing zeta functions of nondegenerate toric hypersurfaces.**
Boston University
- Oct 2017 **Computing zeta functions of nondegenerate toric hypersurfaces.**
Banff International Research Station, p -adic Cohomology and Arithmetic Applications
- Mar 2017 **Toric point counting and applications.**
Banff International Research Station, New Trends in Arithmetic and Geometry of Algebraic Surfaces
- Mar 2017 **Toric point counting and applications.**
Dartmouth College
- Feb 2017 **Toric point counting and applications.**
University of Vermont
- Jul 2016 **Counting points on curves.**
Université Laval, Québec–Maine Number Theory Conference
- Jul 2016 **Counting points on plane curves.**
University of New South Wales
- Mar 2016 **Zeta functions of quartic K3 surfaces over \mathbb{F}_3 .**
University of Oxford, Explicit p -adic methods in number theory
- Jan 2016 **Equidistributions in arithmetic geometry.**
Dartmouth College
- Dec 2015 **Equidistributions in arithmetic geometry.**
Instituto Superior Técnico, Universidade de Lisboa
- Oct 2015 **Effective computations of Hasse–Weil zeta functions.**
Institute for Computational and Experimental Research in Mathematics, Explicit Methods for Modularity of K3 Surfaces and Other Higher Weight Motives
- May 2015 **Effective computations of Hasse–Weil zeta functions.**
Courant Institute of Mathematical Sciences, New York University
- Feb 2015 **Variation of Néron–Severi ranks of reductions of algebraic surfaces.**
Rice University, February 2015
- Nov 2014 **Variation of Néron–Severi ranks of reductions of algebraic surfaces.**
University of New South Wales
- Oct 2014 **Variation of Néron–Severi ranks of reductions of algebraic surfaces.**
Courant Institute of Mathematical Sciences, New York University, October 2014

- Dec 2012 **The point counting problem.**
Courant Institute of Mathematical Sciences, New York University
- Jan 2012 **Faster deterministic integer factorization.**
Courant Institute of Mathematical Sciences, New York University
- Mar 2011 **Étale Cohomology.**
Courant Institute of Mathematical Sciences, New York University
- Jul 2010 **Étale Cohomology.**
Courant Institute of Mathematical Sciences, New York University

SOFTWARE

L-functions and Modular Forms Database (LMFDB).

<http://www.lmfdb.org/>

Controlled reduction: Computation of zeta functions of projective hypersurfaces.

<https://github.com/edgarcosta/controlledreduction>

<https://github.com/edgarcosta/pycontrolledreduction>

Endomorphisms: Rigorous computation of the endomorphism ring of a Jacobian.

<https://github.com/edgarcosta/endomorphisms>

TEACHING EXPERIENCE

Lecturer, Dartmouth College

Spring 18 **Mathematical Cryptography**, *Math 75*.

Fall 17 **Differential Equations**, *Math 23*.

Fall 17 **Probability**, *Math 20*.

Spring 17 **Differential Equations**, *Math 23*.

Fall 16 **Calculus**, *Math 3*.

Spring 16 **Probability**, *Math 20*.

Winter 16 **Differential Equations**, *Math 23*.

Lecturer, New York University

Summer 12 **Linear Algebra**.

Teaching Assistant, New York University

Fall 14 **Theory of Numbers**.

Spring 14 **Calculus I**.

Teaching Assistant, Instituto Superior Técnico

Spring 10 **Complex Analysis and Differential Equations**.

Spring 09 **Complex Analysis and Differential Equations**.

Fall 08 **Complex Analysis and Differential Equations**.

Date: October 28, 2018