

Morena Porzio

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Curriculum Vitae

Education and Formation

- 2020-now **PhD Candidate in Mathematics**, *Columbia University, GSAS*, New York, NY.
- 2022-2024 **Master of Philosophy in Mathematics**, *Columbia University, GSAS*, New York, NY.
- 2020-2022 **Master of Arts in Mathematics**, *Columbia University, GSAS*, New York, NY, GPA: 4.1.
- 2015-2020 **Master's & Bachelor's Degree in Mathematics**, *Scuola Normale Superiore, Honors College*, Pisa, Italy, 100/100 cum Laude, GPA: 4.0.
- 2018-2020 **Master's Degree in Mathematics**, *University of Pisa*, Pisa, Italy, 110/110 cum Laude, GPA: 4.0.
- 2015-2018 **Bachelor's Degree in Mathematics**, *University of Pisa*, Pisa, Italy, 110/110 cum Laude, GPA: 4.0.
- 2010-2015 **High School Diploma**, *Liceo Scientifico F. Vercelli*, Asti, Italy, 100/100 cum Laude.

Publications and Preprints

- 2024 **On the Stable Birationality type of Hilbert schemes of points**, *M. Porzio*, Preprint <https://arxiv.org/abs/2408.07593>.
- 2024 **On the homotopy type of the Beilinson–Drinfeld Grassmannian**, *G. Nocera, & M. Porzio*, Preprint <https://www.math.columbia.edu/~morenaporzio/BDGrassmannian.pdf>.
- 2022 **The Torsion–Free Rank of $Ext^1(A, \mathbb{Z})$ and Whitehead's Problem**, *M. Porzio*, *The Graduate Journal of Mathematics*, Volume 7, Issue 1 (2022), 10-16 <https://gradmath.org/wp-content/uploads/2022/09/GJM2022-Porzio.pdf>.
For a longer version (Bachelor Thesis), see http://www.logicatorino.altervista.org/matteo_viale/Porzio.pdf
- 2022 **An Estimation of Hailstone Radii Using the Collatz Conjecture**, *R. Gupta, & M. Porzio*, *Journal of Student Research (JSR)*, Vol. 11 No. 2 (2022) <https://doi.org/10.47611/jsrhs.v11i2.3638>.
Mentorship through Lumiere education, Premium Research & Publication Program.
- 2020 **Picard Groups of Stacks of Elliptic and Hyperelliptic Curves**, *M. Porzio*, advised by Angelo Vistoli, Master Thesis (2020) <https://etd.adm.unipi.it/t/etd-09102020-102635/>.

Ongoing Projects

- **PhD Thesis advised by Aise Johan de Jong**, *Columbia University*.
The aim of this project is to investigate birational questions about the Hilbert schemes of points of a surface. The motivation is the *Cassels and Swinnerton-Dyer conjecture* for cubic surfaces.
- **Higher Beauville Components of Ceresa Cycles and Modified Diagonals**, *joint work with L. Lagarde, M. Moakher, J. Rawson, and F. Trejos*.
This work studies the vanishing of the higher Beauville components $[C]_{(s)}^e$ (C is a curve embedded in its Jacobian using a degree 1 \mathbb{Q} -divisor e), relating it to the vanishing of *modified diagonal cycles*. We also extend the work of Polishchuk on the sl_2 -action on $CH(J)_{\mathbb{Q}}$ and prove recurrence relations for the Beauville components of $[C]^e$ as well as between the modified diagonal cycles.

- **Project on density of degree d points on product of curves $C \times D$, joint work with J. Berg, Y. Fu, E. Gazaki, J. Rawson, I. Vogt.**

For curves (over number fields) the set of integers $d \in \delta(C/k)$ such that degree d points are dense is fairly understood. In particular it is closed under \mathbb{N}^+ -multiplication. The project focuses on the same set but for a product of curves. After discussing results and constructions for any genera, we focus on low genera (up to genus 2).

- **Project on full DP2's over characteristic 2, joint work with J. Desjardins, A. Knecht, J. Schneider, M. Trip.**

A split del Pezzo surface X/k is called *full* if all k -rational points on X lie on the exceptional curves. Hirschfeld proved that over finite fields, in order to be full, the DP must have degree at most 5 and for degree up to 3 they are classified up to isomorphism. Partial results are known for degree 2 in odd characteristic. The aim of this project is to complete the classification of DP2's over a field of characteristic 2.

Grants and Awards

- 2023/2024 **Winner of PhD Candidate Recognition Award for Excellence in Teaching**, *Math Department of Columbia University*, New York, NY.
- 2020-2026 **Winner of Fellowship Package as a Dean's Fellow and doctoral student at the Math Department of Columbia University**, New York, NY.
- 2022-2024 **Sponsored Member of the Association for Women in Mathematics, AWM**, <https://awm-math.org/>.
- 2019 **Winner of the AILA Award 3+2 2019**, *Associazione Italiana di Logica e sue Applicazioni (Italian Association of Logic and its Applications)*.
<http://www.ailalogica.it/2019/06/03/vincitori-premio-aila-32-anno-2018-19/>
- 2015-2020 **Winner of Full Scholarship with Grant at Scuola Normale Superiore, SNS**, Pisa, Italy.
- 2015 **Winner of INdAM Scholarship**, *National Institution of High Mathematics "Francesco Severi"*, https://www.altamatematica.it/sites/default/files/graduatoria40-2015-2016_0.pdf.
- 2015 **National Gold Medal**, *Italian Mathematical Olympiads (preIMO)*, Cesenatico, Italy.
Scored as the ninth Italian high-school student, <http://olimpiadi.dm.unibo.it/archivio/medagliere/>.
- 2015 **International Bronze Medal**, *European Girls' Mathematical Olympiad (EGMO)*, Minsk, Belarus.
Scored in the top 50 worldwide participants, <https://www.egmo.org/egmos/egmo4/scoreboard/>.
- 2015 **National Bronze Medal**, *Italian Physics Olympiads (preIPhO)*, Senigallia, Italy.
Scored in the top 40 Italian high-school students <https://www.olifis.it/>

Teaching and Mentoring

- Fall '24,'23 **TA of MATHGR6261, Commutative Algebra**, *Columbia University*, New York.
- Since Fall '23 **Graduate Student Editor at Columbia Journal of Undergraduate Mathematics**,
<https://journals.library.columbia.edu/index.php/cjum>.
- Spring '24 **TA of MATHGR6262, Arithmetic and Algebraic Geometry**, *Columbia University*, New York.
- Spring '24 **TA of MATHV2030, Ordinary Differential Equations**, *Columbia University*, New York.
- Summer '23 **Instructor of MATHUN2030, Ordinary Differential Equations**, *Columbia University*, New York.
- Summers '23, '22 **Mentor at Lumiere Education**, *Premium Research and Publication Program*, <https://www.lumiere-education.com/>, Online.

- Spring '23 **TA of MATHGU4043, *Algebraic Number Theory***, Columbia University, New York.
- From '21 to '24 **Administrator of the *Putnam Exam***, Columbia University, New York, NY.
- Fall '22, Spring '22, Fall '21 **TA of MATHUN2030, *Ordinary Differential Equation***, Columbia University, New York.
- Spring '21 **Young Mentor in *THE STEM factor* project**, Global Shapers <https://www.globalshapers.org/>, Florence, Italy.
Cycle of interviews and Q&A sessions, whose main goal is to address gender issues among the STEM world.
- Fall '18 **TA of the master course *Algebra***, University of Pisa, Pisa, Italy.
- Apr '18 **Staff member at EGMO 2018**, <http://www.egmo2018.org/>, Florence, Italy.
Staff member and invigilator at the European Girls' Mathematical Olympiad, an international math competition.
- Springs '16, '17, '18 **Trainer at Italian EGMO training**, *Staff Member – Problems proposer and grader*.
- Winter '17 **Co-instructor at Math Olympiads Internship**, UMI – Unione Matematica Italiana (*Italian Mathematics Union*), Massa, Italy.
- Spring '16 **Staff Member of the National Mathematical Olympiads**, UMI, Cesenatico, Italy.
Corrector of the problems proposed and a staff member at the national mathematical competition.

Invited Talks at Seminars

- Dec 3 2024 **Utah Algebraic Geometry Seminar**, *On the stable birationality of Hilbert schemes of points on surfaces*, <https://www.math.utah.edu/agseminar/>, University of Utah, Salt Lake City.
- Nov 19 2024 **Emory Algebra and Number Theory Seminar**, *On the stable birationality of Hilbert schemes of points on surfaces*, <https://sarangop1728.github.io/eants>, Emory University, Atlanta, GA.
- Nov 11 2024 **Association for Women in Mathematics**, *On the density of algebraic solutions on products of curves*, <https://www.math.columbia.edu/diversity/awm/>, Columbia University.
- Nov 4 2024 **Poster Session at Instructional Workshop on Rational Points**, *On the stable birationality of Hilbert schemes of points on surfaces*, University of Groningen <https://www.rationalpoints.nl/events-2/instructional-workshop-on-rational-points/>.
- Nov 4 2024 **Seminar on Arithmetic Geometry and Algebraic Groups**, *On the stable birationality of Hilbert schemes of points on surfaces*, <https://seminaragag.github.io/>, Online.
- Oct 30 2024 **University of Michigan algebraic geometry seminar**, *On the stable birationality of Hilbert schemes of points on surfaces*, <https://events.umich.edu/event/126925>, University of Michigan, Ann Arbor.
- Oct 24 2024 **Tufts Algebra, Geometry, and Number Theory Seminar**, *On the stable birationality of Hilbert schemes of points on surfaces*, <https://sites.google.com/view/tuftsagents/home>, Tufts University, Boston.
- Jun 28 2024 **WIAG 2** <https://sites.google.com/view/wiag2024/>, Project Group presentation on *Classification of del Pezzo surfaces*, IAS, Institute for Advanced Study, Princeton.
- Oct 1 2024 **Poster Session at Workshop on Algebraic Cycles**, *On the stable birationality of Hilbert schemes of points on surfaces*, <https://sites.google.com/view/workshop-on-algebraic-cycles>, Leibniz Universität, Hannover.

- Apr 10 2024 **Columbia Undergraduate Math Society, Spring 2024**, *Riemann–Roch Theorem for Graphs and Specialization of Divisors from Curves*, <https://math.columbia.edu/~ums/>, Columbia University, NY.
- Mar 22 2024 **Degree d -points on Algebraic Surfaces - AIM Workshop** <https://aimath.org/workshops/upcoming/degreesurface/>, *Stable Birationality Types of Hilbert schemes of points on Surfaces*, Caltech University, Pasadena, CA.
- Mar 6 2024 **Arizona Winter School 2024: Abelian Varieties, Spring 2024**, <https://swc-math.github.io/aws/2024/index.html>, *Project Group presentation on Ceresa's cycles*, University of Arizona, Tucson, AZ.
- Apr 19 2023 **Columbia Undergraduate Math Society, Spring 2023**, *Obstructions to the existence of rational points on algebraic varieties*, <https://www.math.columbia.edu/~ums/2023spring.html>, Columbia University, NY.

Organized Learning Seminars

- Spring 2024 **Elliptic Curves and Abelian Varieties**, <https://www.math.columbia.edu/~morenaporzio/PAWSseminar.html>.
- Spring 2022 **Motives, Standard Conjectures and Weil Cohomology Theories**, <https://math.columbia.edu/~morenaporzio/Motives&WCT.html>.

Talks at Learning Seminars

- Apr 19 2024 **Spring 2024 AG learning seminar: Decomposition of the diagonal**, *Nilpotence conjecture and Kimura's theorem*, https://yoonjookim.github.io/seminars/spring_2024.html, Columbia University.
- Apr 12 2023 **Preprint Seminar, Spring 2023**, *Smooth subvarieties of Jacobians*, <https://www.math.columbia.edu/~tpad/preprintS2023.html>, Columbia University.
- Feb 24 2023 **Spring 2023 Informal AG Seminar on MMP**, *Minimal Model Program in dimension 2*, <https://www.math.columbia.edu/~andresfh/sp23agseminar.html>, Columbia University.
- Feb 16 2023 **Milnor-Witt motives seminar 2023**, *Milnor-Witt K-theory*, <https://math.columbia.edu/~magenroy/MilnorWittMotivesSeminar.html>, Columbia University.
- Nov 16 2022 **Rigid Analytic Geometry and Perfectoid Spaces**, *Generalities on Constructible Sets and Spectral Spaces*, <https://www.math.columbia.edu/~scheffelin/perfectoid>, Columbia University.
- Nov 9 2022 **Non-abelian Hodge correspondence and $P=W$ conjecture**, *Perverse sheaves and Lefschetz hyperplane theorem*, <http://math.columbia.edu/~anabasheva/pw.html>, Columbia University.
- Oct 14 2022 **Motivic homotopy theory learning seminar**, *Basics of the unstable motivic homotopy category*, <http://math.columbia.edu/~magenroy/motivicseminar.html>, Columbia University.
- Nov 24 2021 **SNS Dissertation Talk**, *Surjectivity of Brauer Map for surfaces: positives results and counterexample*, Zoom – Scuola Normale Superiore.
- Oct 29 2021, **Deformation Theory Seminar**, *Application of deformation theory to contracting curves functor $\mathcal{M}_{g,n+1} \rightarrow \mathcal{M}_{g,n}$* , <https://www.math.columbia.edu/~dejong/seminar/seminar-deformation-theory.html>, Columbia University.
- Nov 5 2021
- Apr 27 2021, **Derived Algebraic Geometry Learning Seminar - Formal moduli problems**,
May 5 2021, *Ring Spectra and Generalized Cohomology Theory*, <https://uz.sns.it/~Wilhelm795/FMP2021.html>, Zoom – Scuola Normale Superiore.
- May 11 2021
- Mar 26 2021 **Intersection Theory Learning Seminar**, *Grothendieck-Riemann-Roch*, <https://www.math.columbia.edu/~plei/s21-INT.html>, Columbia University.

Oct 30 2020, **Geometric Invariant Theory Learning Seminar**, *GIT and Coarse Moduli Problems*,
 Nov 6 2020 <https://www.math.columbia.edu/~plei/f20-GIT.html>, Columbia University.

Schools and Conferences

- Nov 4-8 **Instructional workshop on rational points**, *University of Groningen*, Netherlands, <https://www.rationalpoints.nl/events-2/instructional-workshop-on-rational-points/>.
- Sept30- **Workshop on Algebraic Cycles**, *Leibniz Universität*, Hannover, <https://sites.google.com/view/workshop-on-algebraic-cycles>.
- Oct2 2024
- June 24-28 **Collaborative Workshop in Algebraic Geometry**, *IAS - Institute for Advanced Studies*, Princeton, <https://www.ias.edu/math/events/collaborative-workshop-algebraic-geometry>.
- 2024
- May 6-10 **The Geometry of Hilbert Schemes of Points**, *CIRM*, Levico Terme (Italy), <https://sites.google.com/view/ghisp2024/home>.
- 2024
- Apr 22-26 **On the occasion of Hélène Esnault's 70th birthday**, *IHES - Centre de conférence Marilyn et James Simons*, Bures-sur-Yvette (Paris), <https://indico.math.cnrs.fr/event/11114/>.
- 2024
- Mar 18-22 **Degree d points on algebraic surfaces**, *AIM Workshop*, *Caltech University*, Pasadena (CA), <https://aimath.org/workshops/upcoming/degreedsurface/>.
- 2024
- Mar 2-6 **Arizona Winter School 2024: Abelian Varieties**, *University of Arizona*, Tucson (AZ), <https://swc-math.github.io/aws/2024/index.html>.
- 2024
- Dec 7-9 **Monodromy and Its Applications**, **Conference on the Occasion of Nicholas Katz' 80th Birthday**, *Princeton University*, Princeton, <https://sites.google.com/princeton.edu/katz80>.
- 2023
- June 19-23 **Conference on 100 Years of Noetherian Rings**, *IAS - Institute for Advanced Studies*, Princeton, <https://www.ias.edu/math/events/conference-100-years-noetherian-rings>.
- 2023
- June 12-16 **Arithmetic, Birational Geometry, and Moduli Spaces**, *Brown University*, Providence, <https://sites.google.com/view/abgms2023/>.
- 2023
- Nov 18-20 **AGNES Fall 2022 (Algebraic Geometry Northeastern Series)**, *University of Massachusetts*, Amherst, <https://sites.google.com/site/agneshomepage/amherst-2022?authuser=0>.
- 2022
- Oct7, Nov4 **ENYGMMA (Empowering New York Gender Minority Mathematicians)**, *CUNY, Columbia University, Stony Brook University*, New York City, <https://sites.google.com/stonybrook.edu/enygmma/home?authuser=0>.
- 2022, Sept22
- 2023
- Sept 12-16 **Summer school "Motives in Ratisbona"**, *University of Regensburg*, Regensburg, <https://www.uni-regensburg.de/mathematics/motives2022/startseite/index.html>.
- 2022
- May **O-minimality and foliations**, *CIRM (Centre International de Rencontres Mathématiques)*, Virtual Workshop, <https://conferences.cirm-math.fr/2682.html>.
- 31-4(Jun) 2021
- Jun 8-20 **Algebraic and Tropical Online Meetings (ATOM)**, Virtual School, <https://researchseminars.org/seminar/ATOM>.
- 2020
- Aug **Summer School of Logic**, *AILA (Italian Association of Logic and its Applications)/SILFS (Italian Society of Logic and Philosophy of Science)*, Gargnano, Italy, <http://sel.di.unimi.it/>.
- 26-1(Sept) 2019
- Nov 27-30 **Young Perspectives in Deformation Theory**, *Politecnico of Turin*, Turin, <https://sites.google.com/site/ypdt2018/>.
- 2018