

MICHELE GRAFFEO

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RESEARCH INTERESTS

• Algebraic Geometry • Birational Geometry • Resolution of singularities • Hilbert schemes & Moduli spaces of sheaves • Representation theory • Toric Geometry • Enumerative Geometry • Minimal Model Program • Derived Category

ACADEMIC POSITIONS

Postdoctoral Fellow at SISSA - Trieste (Italy) 1/2024-present

Project: “Geometry of Hilbert schemes”

Mentor: A. T. Ricolfi

Postdoctoral Fellow at Politecnico di Milano - Milano (Italy) 2/2023-12/2023

Project: PRIN 2020 “Squarefree Gröbner degenerations, special varieties and related topics”
(MUR, project number 2020355B8Y)

Mentor: P. Lella

Visiting Fellow at SISSA - Trieste (Italy) 1/2023-12/2023

Project: “Nested Hilbert schemes and GIT stability conditions”

Mentor: U. Bruzzo

EDUCATION

PhD in Geometry and Mathematical Physics (cum Laude) at SISSA - Trieste (Italy) 10/2018-11/2022

Thesis: “Zero-dimensional sheaves, group actions and blowups”

Supervisors: U. Bruzzo & A. T. Ricolfi

Master of Science in Mathematics (cum Laude) at University of Pisa - Pisa (Italy) 9/2015-9/2018

Thesis: “Koszul cohomology and Hilbert schemes of points”

Supervisors: M. Franciosi

Bachelor in Mathematics at University of Pisa - Pisa (Italy) 9/2010-5/2015

Thesis: “Il teorema degli zeri in algebre analitiche reali e complesse”

Supervisors: F. Acquistapace

Scientific High School diploma at Liceo Scientifico “Enrico Fermi” - Siacca (Italy) 9/2003-8/2008

TO APPEAR AND PUBLISHED

“Unexpected but recurrent phenomena for Quot and Hilbert schemes of points”,

- with F. Giovenzana, L. Giovenzana and P. Lella. 2024

To appear in *Rendiconti del Seminario Matematico - Politecnico di Torino*

- “5d Conformal Matter”, with M. De Marco, M. Del Zotto, A. Sangiovanni. 2024

JHEP, Volume 2024, article number 306, (2024)

“The geometry of double nested Hilbert schemes of points on curves”,

- with P. Lella, S. Monavari, A. T. Ricolfi and A. Sammartano. 2024

To appear in *TAMS*

“Moduli spaces of $\mathbb{Z}/k\mathbb{Z}$ -constellations over \mathbb{A}^2 ”.

- To appear in *Communications in Contemporary Mathematics* 2024

“A counterexample to the parity conjecture”, with F. Giovenzana, L. Giovenzana and P. Lella.

- To appear in *Algebraic Geometry* 2024

“Growth and integrability of some birational maps in dimension three”, with G. Gubbiotti.

- *Annales Henri Poincaré*, 13 July 2023 2023

“On the Behrend function and the blowup of some fat points”, with A. T. Ricolfi.

- *Advances in Mathematics*, Volume 415, 15 February 2023, 108896 2023

PREPRINTS

- “The motive of the Hilbert scheme of points in all dimensions”, 2024
- with S. Monavari, R. Moschetti A. T. Ricolfi.

TEACHING

T.A. for Topics in advanced algebra at SISSA - Trieste (Italy) 2022-2023

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| T.A. for Algebraic Geometry at SISSA - Trieste (Italy) | 2023-2024 |
| T.A. for Mathematical Analysis at University of Trieste, School of Engineering - Trieste (Italy) | 9/2023-2/2024 |
| T.A. for Algebraic Geometry at SISSA - Trieste (Italy) | 2022-2023 |
| T.A. for Mathematical Analysis at University of Trieste, School of Engineering - Trieste (Italy) | 9/2022-2/2023 |
| T.A. for Mathematical Analysis at University of Trieste, School of Engineering - Trieste (Italy) | 9/2021-2/2022 |
| T.A. for Mathematical Analysis at University of Trieste, School of Engineering - Trieste (Italy) | 9/2020-2/2021 |
| T.A. for Mathematical Analysis at University of Trieste, School of Engineering - Trieste (Italy) | 9/2019-2/2020 |
| T.A. for Mathematical Analysis at University of Pisa, School of Engineering - Pisa (Italy) | 9/2017-2/2018 |
| T.A. for Linear Algebra at University of Pisa, School of Engineering - Pisa (Italy) | 9/2017-2/2018 |
| T.A. for Linear Algebra at University of Pisa, School of Engineering - Pisa (Italy) | 9/2016-2/2017 |

HELD SEMINARS, POSTER SESSIONS & WRITTEN ESSAYS

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| • “Double nested Hilbert schemes of points” | SISSA/IGAP |
| • “On the motives of the Hilbert schemes of points” | University of Milan |
| • “Reducibility of $\text{Hilb}^{78}(\mathbb{A}^3)$ ” | SISSA |
| • “Integrable systems and the Cremona-cubes group” | University of Trieste |
| • “Nested variants of the Hilbert scheme of points” | University of Milan |
| • “Nested variants of the Hilbert scheme of points on smooth curves” | SISSA |
| • “Double nested Hilbert schemes & reverse plane partitions” | Politecnico di Milano |
| • “Double nested Hilbert scheme of points on curves” | MIMUW |
| • “The geometry of double nested Hilbert schemes” | ETH Zürich |
| • “Some open problems and recent progress on the Hilbert schemes of points on smooth threefolds” | MPI MiS |
| • “The algebraic entropy and the Reye configuration” | TU Chemnitz |
| • “On the number twelve in algebraic geometry” | SISSA |
| • “On the dynamics of some birational maps of \mathbb{P}^3 ” | Politecnico di Milano |
| • “Behrend number and blowups of planar fat points” | Politecnico di Milano |
| • “Dynamics of some birational maps of the projective 3-space” | University of Genova |
| • “Dynamics of some birational maps of \mathbb{P}^3 ” | SISSA |
| • “GIT stability conditions on the space of G -Constellations” | University of Milan |
| • “Minimal resolutions of A_k singularities as moduli spaces of $\mathbb{Z}/(k+1)\mathbb{Z}$ -constellations” | Federal University of Paraíba |
| • Poster session at the Workshop “Integrable Probability, Classical and Quantum Integrability” | SISSA |
| • “Moduli spaces of $\mathbb{Z}/k\mathbb{Z}$ -constellations over the affine plane” | University of Utrecht |
| • “On the Behrend function and the blowup of some fat points” | University of Bologna |
| • “How to get your hands dirty with canonical singularities” | SISSA |
| • “Crepan resolutions of symplectic quotient singularities as moduli spaces of constellations” | SISSA |
| • “Introduction to K3 surfaces” | SISSA |
| • “Moduli of representation of quivers and first examples of scattering diagrams” | SISSA/ICTP |
| • “Intersection theory and tautological ring of moduli space of curves” | SISSA |
| • “Blowups: some properties and funny examples” | SISSA |
| • “Towards the Kodaira vanishing theorem” | SISSA |
| • “Playing with quotient singularities” | SISSA |
| • “The real nullstellensatz” | University of Pisa |
| • “Normalization of complex spaces” | University of Pisa |
| • Fifty-pages extended essay on “Markov’s Theorem” based on in-class lectures and individual research | |

ATTENDED SCHOOLS, WORKSHOPS & ADVANCED COURSES

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| • (Invited speaker) “Algebro-geometric techniques for physics: bundles, stacks and supergeometry” | SISSA/IGAP | Spring 2024 |
| • “The Geometry of Hilbert Schemes of Points” | CIRM - Levico Terme | Spring 2024 |
| • (Invited speaker) “Genova-Torino-Milano Seminar” | University of Milan | Winter 2024 |
| • “Enumerative geometry of the Hilbert scheme of points” | SRS Research Station (Les Diablerets) | Winter 2024 |
| • “A day on Hilbert scheme of points” | Humboldt University (Berlin) | Fall 2023 |
| • “Geometry In Bicocca” | Università di Milano-Bicocca | Summer 2023 |
| • “A workshop on Geometry and Commutative algebra” | Politecnico di Milano | Summer 2023 |
| • “Genova-Torino-Milano Seminar” | Università degli studi di Genova | Spring 2023 |
| • “Hilbert schemes, moduli spaces, and symplectic varieties” | Université de Nantes | Spring 2023 |
| • “Commutative Algebra TOwards Applications” | (Torino) | Spring 2023 |
| • “Mini-school: Real and complex birational geometry” | at University of Milan (Milano) | Spring 2023 |
| • “Refined invariants in Moduli Theory” | (Trieste) | Spring 2023 |
| • (Invited speaker) “5th Christmas Workshop on Moduli Spaces and Integrable Systems” | (Genova) | Winter 2022 |

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| • “AGATES-Deformation theory workshop” at IMPAN (Warsaw) | Winter 2022 |
| • “Young Researchers Meeting in Algebra and Geometry 2022” conference at SISSA (Trieste) | Fall 2022 |
| • “Recent Advances in Classical Algebraic Geometry” conference at Jagiellonian University (Krakow) | Summer 2022 |
| • “Mini-workshop on Quiver Varieties and Related Topics” workshop at University of Oxford | Summer 2022 |
| • “New Perspectives on Hyperkähler Manifolds” workshop at Levico Terme | Spring 2022 |
| • “Moduli Spaces and Stability Conditions” school & workshop at Levico Terme | Spring 2022 |
| • “Derived Functors” PhD course by U. Bruzzo | Fall 2020 |
| • “Hilbert schemes, McKay correspondence and singularities” winter school at Univ. Paris Diderot (Paris) | Winter 2019 |
| • “Localisation in Enumerative Geometry” PhD course by A. T. Ricolfi | Fall 2019 |
| • “Differentiable Orbifolds” PhD course by B. Fantechi | Fall 2019 |
| • “Foliations in algebraic geometry” summer school at Istitut Fourier (Grenoble) | Summer 2019 |
| • “Gauge Theory” PhD course by A. Tikhomirov | Spring 2019 |
| • “Advanced topics in algebraic geometry” PhD course by E. Arbarello | Fall 2018 |
| • “Algebraic surfaces: the cubic surface, the Cayley cubic, lines on smooth surfaces” PhD course by F. Catanese | Fall 2018 |
| • “Cones of divisors and positivity” PhD course by L. Lombardi | Fall 2018 |
| • “Integrable systems from moduli spaces of stable curves” PhD course by P. Rossi | Fall 2018 |

PRIZES

- Lutman Prize for the best PhD thesis in Mathematics, 2023.

Memberships

- GNSAGA-INdAM, Italy Fall 2024-present

LANGUAGES & IT SKILLS

- Italian: native; English: fluent; French: basic.
- Macaulay2, GAP, Latex, Unity, Windows OS, Android OS (Developer), Microsoft application, Office suite (ECDL) (Advanced), Ubuntu, C programming language, html.

REFEREES

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|-------------------|-----------------------------|
| Ugo Bruzzo | Andrea Tobia Ricolfi |
| SISSA | SISSA |
| bruzzo@sisssa.it | aricolfi@sisssa.it |

ORGANISATION OF EVENTS

- Co-organiser with U. Bruzzo, B. G. Otero, D. H. Serrano, D. S. Gómez of the conference "WAGP24P" Trieste (Italy) June 24
- Co-organiser with P. Lella, S. Monavari, A. Ricolfi, A. Sammartano of the conference "GHiSP" Levico Terme (Italy) May 24
- Co-organiser of the Algebraic Geometry seminar in SISSA 2021-22
- Co-organiser of the Algebraic Geometry seminar in SISSA/IGAP 2020-21
- Co-organiser of the Algebraic Geometry seminar joint between SISSA and ICTP 2019-20
- Co-organiser of the Algebraic Geometry seminar in SISSA 2018-19

OTHER TASKS

- Museum guide of a Mathematics exhibition named “Mathematics in ancient Greece” Pisa (Italy) 2018
- Developed strong analytical, problem-solving and time management skills, throughout my PhD studies at SISSA.
- Proven excellent communication, coaching and leadership skills, when working as a teaching assistant.
- Learnt how to be a team-player and how to get the best from joint outcome when working in a group.
- Learnt how to work and deliver results in high-pressure situations, such as studying and working at the same time.
- Volunteer work with both the needy and the elderly.
- Interests and hobbies: music, politics and chess.