

# 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

<b>Postdoctoral Fellow</b> at SISSA - Trieste (Italy)	1/2024-present
Project: “Geometry of Hilbert schemes”	
Mentor: A. T. Ricolfi	
<b>Postdoctoral Fellow</b> 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	
<b>Visiting Fellow</b> at SISSA - Trieste (Italy)	1/2023-12/2023
Project: “Nested Hilbert schemes and GIT stability conditions”	
Mentor: U. Bruzzo	

## EDUCATION

<b>PhD in Geometry and Mathematical Physics (cum Laude)</b> at SISSA - Trieste (Italy)	10/2018-11/2022
Thesis: “Zero-dimensional sheaves, group actions and blowups”	
Supervisors: U. Bruzzo & A. T. Ricolfi	
<b>Master of Science in Mathematics (cum Laude)</b> at University of Pisa - Pisa (Italy)	9/2015-9/2018
Thesis: “Koszul cohomology and Hilbert schemes of points”	
Supervisors: M. Franciosi	
<b>Bachelor in Mathematics</b> at University of Pisa - Pisa (Italy)	9/2010-5/2015
Thesis: “Il teorema degli zeri in algebre analitiche reali e complesse”	
Supervisors: F. Acquistapace	
<b>Scientific High School diploma</b> at Liceo Scientifico “Enrico Fermi” - Siacca (Italy)	9/2003-8/2008

## TO APPEAR AND PUBLISHED

• “Classical Algebraic Geometry and Discrete Integrable Systems”, with G. Alecci and A. Stokes.	2025
To appear in <i>Symmetry and Integrability of Difference Equations</i> - Lecture notes of ASIDE15	
• “The geometry of double nested Hilbert schemes of points on curves”, with P. Lella, S. Monavari, A. T. Ricolfi and A. Sammartano.	2025
<i>Transactions of the American Mathematical Society</i> 378, 6013-6047 (2025)	
• “A counterexample to the parity conjecture”, with F. Giovenzana, L. Giovenzana and P. Lella.	2025
<i>Algebraic Geometry</i> , 12 (2025), no. 2, 173–188	
• “Unexpected but recurrent phenomena for Quot and Hilbert schemes of points”, with F. Giovenzana, L. Giovenzana and P. Lella.	2024
<i>Rendiconti del Seminario Matematico - Politecnico di Torino</i> , 82 (2024), no. 1, 145–170.	
• “5d Conformal Matter”, with M. De Marco, M. Del Zotto and A. Sangiovanni.	2024
<i>JHEP</i> , Volume 2024, article number 306, (2024)	
• “Moduli spaces of $\mathbb{Z}/k\mathbb{Z}$ -constellations over $\mathbb{A}^2$ ”.	2024
<i>Communications in Contemporary Mathematics</i> 27 (2025), no. 03, 2450019	
• “Growth and integrability of some birational maps in dimension three”, with G. Gubbiotti.	2023
<i>Annales Henri Poincaré</i> , 13 July 2023	
• “On the Behrend function and the blowup of some fat points”, with A. T. Ricolfi.	2023
<i>Advances in Mathematics</i> , Volume 415, 15 February 2023, 108896	

PREPRINTS

- “New components of Hilbert schemes of points and 2-step ideals”, 2025  
with F. Giovenzana, L. Giovenzana and P. Lella.
- “Invariants of nested Hilbert and Quot Schemes on surfaces”, 2025  
with N. Fasola, D. Lewański and A. T. Ricolfi
- “Enumeration of partitions via socle reduction”, 2025  
with S. Monavari, R. Moschetti and A. T. Ricolfi
- “The Painlevé equivalence problem for a constrained 3D system”, 2024  
with G. Filipuk, G. Gubbiotti and A. Stokes
- “The motive of the Hilbert scheme of points in all dimensions”, 2024  
with S. Monavari, R. Moschetti and A. T. Ricolfi

TEACHING

Lecturer

- (PhD course) *Computations in Algebraic Geometry* at UFMG - Belo Horizonte (MG, Brazil) 2025
- (Advanced mini-course) *Classical Algebraic Geometry and Integrable Systems* at ASIDE - Milan (Italy) 2025
- (PhD course) *Complex algebraic surfaces* at SISSA - Trieste (Italy) 2025
- (PhD course) *Computations in Algebraic Geometry* at IMECC/UNICAMP - Campinas (SP, Brazil) 2025

Teaching Assistant

- (PhD course) *Topics in advanced algebra* at SISSA - Trieste (Italy) 2024-2025
- (PhD course) *Algebraic Geometry* at SISSA - Trieste (Italy) 2024-2025
- (PhD course) *Topics in advanced algebra* at SISSA - Trieste (Italy) 2023-2024
- (PhD course) *Algebraic Geometry* at SISSA - Trieste (Italy) 2023-2024
- Mathematical Analysis* at University of Trieste, School of Engineering - Trieste (Italy) 9/2023-2/2024
- (PhD course) *Algebraic Geometry* at SISSA - Trieste (Italy) 2022-2023
- Mathematical Analysis* at University of Trieste, School of Engineering - Trieste (Italy) 9/2022-2/2023
- Mathematical Analysis* at University of Trieste, School of Engineering - Trieste (Italy) 9/2021-2/2022
- Mathematical Analysis* at University of Trieste, School of Engineering - Trieste (Italy) 9/2020-2/2021
- Mathematical Analysis* at University of Trieste, School of Engineering - Trieste (Italy) 9/2019-2/2020
- Mathematical Analysis* at University of Pisa, School of Engineering - Pisa (Italy) 9/2017-2/2018
- Linear Algebra* at University of Pisa, School of Engineering - Pisa (Italy) 9/2017-2/2018
- Linear Algebra* at University of Pisa, School of Engineering - Pisa (Italy) 9/2016-2/2017

HELD SEMINARS, POSTER SESSIONS & WRITTEN ESSAYS

- “Elementary components of the nested Hilbert schemes of points & their schematic structure” UNICAMP Campinas (SP, Brazil)
- “A geometria do esquema de Hilbert aninhado” UFF Niterói (RJ, Brazil)
- “Crepant resolutions of canonical quotient singularities and moduli spaces of  $G$ -constellations” Belo Horizonte (MG, Brazil)
- “The Hilbert schemes of points: how to understand its geometry” Belo Horizonte (MG, Brazil)
- “The geometry of Hilbert schemes of points and 2-step ideals” Olinda (PE, Brazil)
- “The irreducible components of the Hilbert Scheme of points” ULB Bruxelles (Belgium)
- “A combinatorial approach to double nested Hilbert schemes of points” University of Pisa
- “The Hilbert scheme of points and its motive” João Pessoa (PB, Brazil)
- “New components of Hilbert schemes of points and 2-step ideals” UFF Niterói (RJ, Brazil)
- “Double nested Hilbert schemes of points on smooth curves” IMPA Rio de Janeiro (Brazil)
- “The geometry of the Hilbert scheme of points, and its nested variants” Razlog (Bulgaria)
- “La geometria dello schema di Hilbert di punti, e sue varianti” Isola delle Femmine (Palermo)
- “Irreducibility of the Hilbert scheme of points and the class of 2-step algebras” IME-USP São Paulo (Brazil)
- “Motives of the Hilbert schemes of points in all dimensions” ETH Zürich
- “Algebraic curves and one-dimensional complex manifolds” SISSA
- “The geometry of the Hilbert scheme of points and its variants” EPFL
- “Toric singularities” SISSA
- “The motive of the Hilbert scheme of points in all dimensions” University of Pisa
- Poster “Syzygies, Iarrobino’s example on 78 points and new components of Hilbert schemes” Jagiellonian University (Krakow)
- “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 “Moduli spaces of $\mathbb{Z}/k\mathbb{Z}$ -constellations over $\mathbb{A}^2$ ”	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
• “Crepant 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

• <b>(Invited speaker)</b> “Bandoleros 2025” IMECC/UNICAMP (Campinas)	Fall 2025
• <b>(Invited speaker)</b> “LEGALzinho” UFF (Niterói)	Fall 2025
• <b>(Invited speaker)</b> “First Brazilian Northeastern Meeting on Commutative Algebra and Algebraic Geometry” (Olinda)	Fall 2025
• “TULSF X - A one-day algebraic geometry meeting” (Ferrara)	Fall 2025
• <b>(Invited speaker)</b> “WAGP - Moduli Spaces in (Super)Geometry and Mathematical Physics” (João Pessoa)	Fall 2025
• <b>(Invited speaker)</b> “Geometry in Algebra, Algebra in Geometry” IMPA (Rio de Janeiro)	Fall 2025
• “Geometry In Bicocca” Università di Milano-Bicocca	Summer 2025
• <b>(Invited speaker)</b> “WAGP - Geometry And Physics of Higgs Moduli” (Razlog)	Summer 2025
• “Jordan Types of Artinian Algebras and Geometry of Punctual Hilbert Schemes” Université Côte d’Azur	Summer 2025
• “Modules & Rings: Recent Developments in Commutative Algebra” University of Genova	Spring 2025
• <b>(Invited speaker)</b> “Abecedarian of SIDE (ASIDE)” University of Milan	Spring 2025
• <b>(Invited speaker)</b> “Giornate di Geometria Algebrica e Argomenti Correlati XVII” Isola delle Femmine (Palermo)	Spring 2025
• “GC Legacy - A meeting in Algebraic Geometry” Politecnico di Torino	Winter 2025
• “TULSF IX - A one-day algebraic geometry meeting” SISSA (Trieste)	Fall 2024
• <b>(Poster session)</b> “Syzygies and Hilbert Schemes” Jagiellonian University (Krakow)	Fall 2024
• <b>(Invited speaker)</b> “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
• <b>(Invited speaker)</b> “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
• <b>(Invited speaker)</b> “5th Christmas Workshop on Moduli Spaces and Integrable Systems” (Genova)	Winter 2022
• “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

- **(Poster session)** “Integrable Probability, Classical and Quantum Integrability” workshop at SISSA Spring 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 SISSA in Mathematics, 2023.

## MEMBERSHIPS

- GNSAGA-INdAM, Italy Fall 2024-present
- INFN, Italy Fall 2025-present

## COMMITTEE MEMBER

- Committee member for master degree at EPFL, Switzerland Winter 2025
- Committee member for PhD degree at Federal University of Paraíba, Brazil Winter 2025

## LANGUAGES & IT SKILLS

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

## REFEREES

<b>Ugo Bruzzo</b>	<b>Paolo Lella</b>	<b>Andrea Tobia Ricolfi</b>
SISSA	Politecnico di Milano	SISSA
bruzzo@sisssa.it	paolo.lella@polimi.it	aricolfi@sisssa.it

## ORGANISATION OF EVENTS

- Co-organiser with U. Bruzzo, I. Penkov of the "Mini-workshop on flag supermanifolds, and supergeometries" Trieste (Italy) Feb 26
- Co-organiser with U. Bruzzo, E. Pavia of the conference "TULSF - IX" Trieste (Italy) Nov 24
- Co-organiser with U. Bruzzo, B. Graña Otero, D. H. Serrano, D. S. Gómez of the conference "WAGP24" 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.