

## Andrea T. Ricolfi

### Assistant Professor (rtd-B) at SISSA, Trieste

Geometry and Mathematical Physics

Since 1/2/2022: abilitato professore di seconda fascia

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### EMPLOYMENT HISTORY & EDUCATION

**Assistant Professor** (rtd-B) at Università di Bologna 9/2021-6/2022

**Postdoc** at SISSA, Trieste (*SISSA Mathematical Fellowship*) 11/2018-9/2021

**Postdoc** at Max-Planck Institut für Mathematik, Bonn 11/2017-10/2018

**PhD in Mathematics** at University of Stavanger (UiS Norway) 9/2013-10/2017

Thesis: *Local Donaldson–Thomas invariants and their refinements*

ISBN: 978-82-7644-734-7 ISSN: 1890-1387 PhD thesis no. 363. Available [here](#)

Trial Lecture: *Symmetric obstruction theories and Joyce's perverse sheaves*

Advisors: Prof. Martin Gulbrandsen, Lars Halle

**M.S. in Mathematics** (ALGANT Program: Università di Padova & Université Bordeaux 1) 10/2010-7/2012

Thesis: *Bertini's theorem on generic smoothness*. Advisor: Prof. Qing Liu

### VISITS AND SCHOLARSHIPS

**Imperial College London** Visiting PhD (PI. Prof. Richard Thomas) 2/2015-6/2015

**University of Copenhagen** 4 short term visits (PI. Prof. Lars Halle) 2015-17

**SISSA:** Research Scholarship 6/2013

### RESEARCH INTERESTS

- Enumerative geometry of *moduli spaces of sheaves* (in a broad sense: motivic/refined/K-theoretic/enumerative invariants) • Hilbert and Quot schemes, Donaldson–Thomas invariants, virtual classes, virtual localisation • Moduli stacks of sheaves and of quiver representations, Joyce's d-critical loci • Grothendieck rings of varieties, Hall algebras
- Cohomology of moduli spaces of curves, tautological relations, compactified universal Jacobians

### SUPERVISION

#### Current PhD students:

- Solomiya Mizyuk (SISSA), co-supervised with Prof. Barbara Fantechi. Ongoing.
- Michele Graffeo (SISSA), co-supervised with Prof. Ugo Bruzzo. Ongoing.
- Ajay Gautam (SISSA), co-supervised with Prof. Barbara Fantechi. Ongoing.
- Elisa Vitale (SISSA), co-supervised with Prof. Barbara Fantechi. Ongoing.

### GRANTS

**SISSA:** Dipartimenti di Eccellenza travel grant: 9000 € 2018-21

**Stavanger:** UiS Travel Grant: the equivalent of around 5000 € per year 2013-17

### PUBLICATIONS

#### Articles

- Hilbert squares of degeneracy loci*, with E. FATIGHENTI, F. MEZZINI, G. MONGARDI. To appear in Rendiconti del Circolo Matematico di Palermo Series 2. [\[Preprint\]](#)
- On the motive of the nested Quot scheme of points on a curve*, with S. MONAVARI. Journal of Algebra, Vol. 610, 99–118 (2022) [\[Journal\]](#)
- Higher rank motivic Donaldson–Thomas invariants of  $\mathbb{A}^3$  via wall-crossing, and asymptotics*, with A. CAZZANIGA and D. RALAIWAOSAONA. Mathematical Proceedings of the Cambridge Philosophical Society (2022) [\[Journal\]](#)
- Sur la lissité du schéma Quot ponctuel emboîté*, with S. MONAVARI (in French). Canadian Mathematical Bulletin (2022). DOI: 10.4153/S0008439522000224 [\[Journal\]](#)
- Framed sheaves on projective space and Quot schemes*, with A. CAZZANIGA. Mathematische Zeitschrift, 300, 745–760 (2022). [\[Journal\]](#)
- Framed motivic Donaldson–Thomas invariants of small crepant resolutions*, with A. CAZZANIGA. Mathematische Nachrichten, Vol. 295, Issue 6 (2022), 1096–1112. [\[Journal\]](#)
- Higher rank K-theoretic Donaldson–Thomas theory of points*, with N. FASOLA and S. MONAVARI. Forum Math. Sigma, Vol. 9 E15, 1–51. [\[Journal\]](#)
- The equivariant Atiyah class*. C. R. Math. Acad. Sci. Paris. Volume 359, Issue 3 (2021) 257–282. [\[Journal\]](#)
- On the motive of the Quot scheme of finite quotients of a locally free sheaf*. Journal de Mathématiques Pures et Appliquées, Volume 144, 2020, Pages 50–68. [\[Journal\]](#)
- Virtual classes and virtual motives of Quot schemes on threefolds*. Advances in Mathematics, 369 (2020) 107182. [\[Journal\]](#)
- The local motivic DT/PT correspondence*, with B. DAVISON. Journal of the London Mathematical Society, Vol. 104, Issue 3 (2021), 1384–1432. [\[Journal\]](#)
- Virtual counts on Quot schemes and the higher rank local DT/PT correspondence*, with S. BEENTJES. Math. Res. Lett., Vol. 28, no. 4 (2021), 967–1032. [\[Journal\]](#)
- Pullbacks of universal Brill–Noether classes via Abel–Jacobi morphisms*, with N. PAGANI and J. VAN ZELM. Mathematische Nachrichten, Vol. 293, Issue 11 (2020), 2187–2207. [\[Journal\]](#)

14. *The Hilbert scheme of hyperelliptic Jacobians and moduli of Picard sheaves.* Algebra & Number Theory 14-6 (2020), 1381–1397. [Journal]
15. *Jet bundles on Gorenstein curves and applications*, with L. GATTO. Journal of Singularities, Volume 21 (2020), 50–83. [Journal]
16. *The DT/PT correspondence for smooth curves.* Mathematische Zeitschrift 290 (2018), no. 1-2, 699–710. [Journal]
17. *On coherent sheaves of small length on the affine plane*, with R. MOSCHETTI. Journal of Algebra, 516 (2018), pp. 471–489. [Journal]
18. *Local contributions to Donaldson–Thomas invariants.* Int. Math. Res. Not. IMRN, 2018 (2018), no. 19, 5995–6025. [Journal]
19. *The Euler characteristic of the generalized Kummer scheme of an Abelian threefold*, with M. GULBRANDSEN. Geometriae Dedicata, 182 (2016), Issue 1, pp. 73–79. [Journal]

#### Preprints

1. *On the Behrend function and the blowup of some fat points*, with M. GRAFFEO. [2022]
2. *The  $d$ -critical structure on the Quot scheme of points of a Calabi–Yau 3-fold*, with M. SAVVAS [2021]
3. *Indecomposability of derived categories in families*, with F. BASTIANELLI, P. BELMANS and S. OKAWA. [2020]
4. *Moduli spaces of semiorthogonal decompositions in families*, with P. BELMANS and S. OKAWA. With an appendix coauthored with W. LOWEN. [2020]

#### Books

1. *An invitation to modern enumerative geometry.* Accepted as a monograph by Springer. Lecture notes based on two PhD courses on Enumerative Geometry and Donaldson–Thomas invariants I taught at SISSA in Fall 2019 and Spring 2021.

#### TALKS AT INTERNATIONAL CONFERENCES AND WORKSHOPS

- *Higher rank  $K$ -theoretic Donaldson–Thomas theory*  
IV Congresso Brasileiro de Jovens Pesquisadores em Matemática pura,  
aplicada e estatística (João Pessoa, Brazil) 10/2022
- *A tale of two  $d$ -critical structures*  
Young Researchers Meeting in Algebra and Geometry 2022 (SISSA, Trieste) 9/2022
- *A tale of two  $d$ -critical structures*  
Bandoleros 2022 (Ankara, Turkey + remote) 5/2022
- *A motivic wall-crossing formula*  
Grothendieck ring and Derived category: a gathering (Turin) 4/2022
- *Virtual invariants of Quot schemes on 3-folds*  
Bandoleros 2021 – Campinas Algebraic Geometry Summer Meeting 2021 (remote) 2/2021
- *Virtual classes and virtual motives of Quot schemes on 3-folds*  
HMI Workshop on Gauge theory and virtual invariants (Dublin) 5/2019
- *A higher rank local DT/PT correspondence*  
Workshop in Algebraic Geometry (Milan) 12/2018
- *A component of the Hilbert scheme of hyperelliptic Jacobians*  
Algebraic Geometry and Foliations: in celebration of Israel Vainsencher's  
70th Birthday, (Belo Horizonte, Brazil) 11/2018
- *A motivic wall-crossing formula for sheaves on 3-folds*  
Motives of Calabi–Yau manifolds (Kraków) 5/2018
- *Motivic local DT invariants*  
IMPAN (Kraków) 3/2018
- *The DT/PT correspondence for smooth curves*  
A Fall Meeting in Algebraic Geometry and related topics (Turin) 10/2017
- *Local contributions to DT invariants*  
National Algebra Meeting (Oslo) 11/2016
- *Critical loci and their virtual motives*  
National Algebra Meeting (Oslo) 11/2015
- *Partitions and generalized Kummer varieties*  
Moduli Spaces and Derived Categories (Warwick) 2/2015
- *Motivic Donaldson–Thomas Invariants*  
GAEL XXII (SISSA, Trieste) 6/2014
- *Limits of Special Weierstrass Points*  
National Algebra Meeting (Oslo) 11/2013

#### INVITED SEMINAR TALKS

- *$K$ -theoretic sheaf counting* (Genova) 5/2022
- *A motivic DT/PT correspondence* (Lausanne) 5/2022
- *Refined invariants of moduli spaces* (Mathematical Colloquium, João Pessoa, Brazil) 4/2022
- *Refined sheaf counting* (Trento) 2/2022
- *Sheaf counting and Quot schemes* (Milano) 11/2021
- *$d$ -critical structure(s) on the Quot scheme of points on a 3-fold* (CMSA Harvard University) 10/2021
- *The  $d$ -critical structure on the Quot scheme of points on a 3-fold* (SISSA, Trieste) 5/2021
- *Refinements of higher rank DT invariants* (KIAS Seoul, remote) 3/2021
- *Higher rank motivic DT invariants* (SISSA, Trieste) 2/2021

◦ <i>Higher rank K-theoretic Donaldson–Thomas theory of points</i> (Kansas University, remote)	10/2020
◦ <i>Higher rank K-theoretic Donaldson–Thomas theory of points</i> (Bologna)	10/2020
◦ <i>A moduli space of semiorthogonal decompositions</i> (Rutgers New Jersey, remote)	9/2020
◦ <i>Higher rank K-theoretic Donaldson–Thomas theory of points</i> (UCSD San Diego, remote)	4/2020
◦ <i>Moduli of semiorthogonal decompositions</i> (Stavanger)	11/2019
◦ <i>A motivic DT/PT correspondence via Quot schemes</i> (Oxford)	11/2019
◦ <i>Virtual invariants of Quot schemes on 3-folds</i> (Copenhagen)	5/2019
◦ <i>A component of the Hilbert scheme of hyperelliptic Jacobians</i> (Rome)	4/2019
◦ <i>Le schéma de Hilbert d'une Jacobienne hypérelliptique</i> (Nancy)	10/2018
◦ <i>The DT/PT correspondence for smooth curves</i> (University of Edinburgh)	1/2018
◦ <i>Curve counting via Quot schemes</i> (Utrecht University)	12/2018
◦ <i>The DT/PT correspondence for smooth curves</i> (KTH, Stockholm)	11/2017
◦ <i>Counting rational curves on toric threefolds</i> (Copenhagen)	2/2016
◦ <i>Families of Abel–Jacobi curves</i> (Turin, Italy)	12/2015
◦ <i>Curve counting on threefolds</i> (Bergen, Norway)	10/2015
◦ <i>Introduction to Motivic Integration</i> (Imperial College London)	4/2015
◦ <i>Refined curve counting on Calabi–Yau threefolds</i> (KU Leuven)	3/2015
◦ <i>Localisation in Donaldson–Thomas theory</i> (UCL, London)	2/2015
◦ <i>A Hamilton's Principle in Algebraic Geometry</i> (Turin, Italy)	12/2014
◦ <i>Curve Counting and Box Counting</i> (Turin, Italy)	6/2014
◦ <i>Curve Counting Invariants and Euler Characteristics</i> (Bergen, Norway)	2/2014

## SELECTED SCHOOLS AND WORKSHOPS

◦ Japanese-European Symposium on Symplectic Varieties and Moduli Spaces (Bologna–Tokyo)	3/2022
◦ Ricercatori in Algebra e Geometria (Pisa)	9/2021
◦ Winter School on Enumerative Geometry and Modular Forms (Frankfurt)	2/2019
◦ Curves, Sheaves and Moduli (Stavanger)	4/2018
◦ Workshop on Complex Algebraic Geometry – Pirola 60th (Barcellona)	2/2018
◦ Enumerative Geometry Beyond Numbers (MSRI, Berkeley)	1/2018
◦ Modern Moduli Theory (Oxford)	9/2017
◦ British Algebraic Geometry (Cambridge)	9/2017
◦ Abel Symposium (Svolvær)	8/2017
◦ Stability conditions on triangulated categories and applications (Nordfjordeid)	6/2016
◦ Varieties of Calabi–Yau type (Warsaw)	4/2016
◦ Derived Categories and Moduli Spaces (Stavanger)	9/2015
◦ PRAGMATIC Summer school on Moduli of curves and line bundles (Catania)	7/2015
◦ GAeL 2015 (Leuven)	6/2015
◦ Motivic invariants related to K3 and Abelian geometries (Berlin)	2/2015
◦ Modern trends in Gromov–Witten theory (Hannover)	9/2014
◦ GAeL 2014 (Trieste)	6/2014
◦ Toric degenerations and Mirror Symmetry (Nordfjordeid)	6/2014

## TEACHING

◦ Algebraic Geometry (2 <sup>nd</sup> Year Master Università di Trieste and SISSA PhD)	Fall 2022
◦ <i>Geometria e Algebra T</i> ; Bachelor Course (60 hours – Ingegneria Chimica e Biochimica, Bologna)	Fall 2021
◦ <i>Localisation in Enumerative Geometry</i> ; PhD Course (20 hours – SISSA, Trieste)	Spring 2021
◦ <i>Techniques in Enumerative Geometry</i> ; PhD Course (20 hours – SISSA, Trieste)	Fall 2019
◦ <i>Algebraic Geometry</i> MAT630 (Master course, University of Stavanger)	Spring 2017
◦ T.A. for <i>Mathematical Methods 2</i> MAT200 (Bachelor, University of Stavanger)	Spring 2016
◦ T.A. for <i>Linear Algebra</i> MAT110 (Bachelor, University of Stavanger)	Fall 2015
◦ <i>Discrete Mathematics</i> MAT120 (Bachelor, University of Stavanger)	Fall 2014
◦ T.A. for <i>Geometria e Algebra Lineare</i> (Politecnico di Torino)	Spring 2013

## PhD COURSES ATTENDED

◦ <i>Deformation Theory</i> (following “Deformations of algebraic schemes” by Sernesi)	2013-14
◦ <i>Mirror Symmetry</i> (following “Mirror Symmetry and Algebraic Geometry” by Cox–Katz)	2016

## ORGANISATION OF EVENTS AND OTHER TASKS

◦ Been referee for >10 high level international journals	
◦ Co-organiser of the Algebraic Geometry seminar SISSA-University of Trieste	2020-21
◦ Co-organiser of the Algebraic Geometry seminar in SISSA/IGAP	2020-21
◦ Postdoc representative for the Mathematics area at SISSA, Trieste	2019-20
◦ Co-organiser of the Algebraic Geometry seminar joint between SISSA and ICTP	2019-20
◦ Local organiser of the Workshop <i>Derived Categories and Moduli Spaces</i> (Stavanger)	9/2015