

Cinzia Casagrande

Curriculum Vitae

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Italian, born in Milano on 26/7/1974, two children.

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Education and positions

Education

- *Laurea* in Mathematics. University of Milano, October 1993 - October 1998. Final grade 110/110 *cum laude*. Graduation Thesis: “*Threefolds with a hyperplane section of geometric genus 1*”. Supervisor Professor Marino Palleschi.
- Ph.D. in Mathematics. University of Roma “La Sapienza”, February 1999 - January 2003. Ph.D. Thesis: “*Toric varieties: equivariant contractions and Fano varieties*”. Advisor Professor Lucia Caporaso (University of Roma Tre).

Positions

- Present position, since January 2011: *Professore Associato*, [Mathematics Department, University of Torino](#).
- June 2007 - January 2011: *Ricercatore*, Mathematics Department, University of Pavia (permanent position).
- January 2004 - May 2007: *Ricercatore*, Mathematics Department, University of Pisa (permanent position).
- March 2003 - December 2003: post-doc position (*assegno di ricerca*), Mathematics Department, University of Roma Tre.

Visits abroad

- Max Planck Institute for Mathematics, Bonn, *Guest*, 1/3/2014 - 24/5/2014.
- Ludwig-Maximilians University, Munich, 15/4/2010 - 31/5/2010.
- Mathematical Sciences Research Institute, Berkeley, for the program *Algebraic Geometry*, 23/2/2009 - 30/4/2009.
- Institut Fourier, Grenoble, *Chercheur Invité*, June 2006.
- University of Warwick, for the workshop *Warwick Teach-in on 3-folds*, 7/1/2002 - 2/2/2002.
- Institut Fourier, Grenoble, March, April and October 2001.
- Massachusetts Institute of Technology (M.I.T.), Cambridge, Massachusetts, *Visiting Student*, September - December 1999.
- Université de Paris-XI, Orsay, within the exchange program *Erasmus*, February - July 1997.

Financial support for these visits was provided by: *Max Planck Institute for Mathematics*, *INdAM (Istituto Nazionale di Alta Matematica)*, *Institut Fourier*, *University of Warwick*, *EAGER (European Algebraic Geometry Research Training Network)*, *M.I.T.*, *European Community*.

Scientific activity

Research interests

My research field is **algebraic geometry**, over \mathbb{C} or over an algebraically closed field of characteristic zero. I have been working mainly on the following subjects:

- Fano varieties, Mori dream spaces and birational geometry, contractions, numerical invariants of Fano varieties (in particular the second Betti number);
- families of rational curves, the rational quotient, extremal rays;
- toric varieties, toric Mori theory, toric Fano varieties;
- moduli of curves, moduli of line bundles on curves.

Publications

Research papers:

1. "On the birational geometry of toric Fano 4-folds", *Comptes Rendus de l'Académie des Sciences* 332, 1093–1098, 2001.
2. "Contractible classes in toric varieties", *Mathematische Zeitschrift* 243, 99–126, 2003.
3. "Toric Fano varieties and birational morphisms", *International Mathematics Research Notices* 27, 1473–1505, 2003.
4. "Sur une conjecture de Mukai", with Laurent Bonavero, Olivier Debarre and Stéphane Druel, *Commentarii Mathematici Helvetici* 78, 601–626, 2003.
5. "Centrally symmetric generators in toric Fano varieties", *Manuscripta Mathematica* 111, 471–485, 2003.
6. "Combinatorial properties of stable spin curves", with Lucia Caporaso, *Communications in Algebra* 31 (8), 3653–3672, 2003.
7. "Moduli of Prym curves", with Edoardo Ballico and Claudio Fontanari, *Documenta Mathematica* 9, 265–281, 2004.
8. "The number of vertices of a Fano polytope", *Annales de l'Institut Fourier* 56 (1), 121–130, 2006.
9. "On covering and quasi-unsplit families of curves", with Laurent Bonavero and Stéphane Druel, *Journal of the European Mathematical Society* 9, 45–57, 2007.
10. "Moduli of roots of line bundles on curves", with Lucia Caporaso and Maurizio Cornalba, *Transactions of the American Mathematical Society* 359, 3733–3768, 2007.
11. "On the Picard number of almost Fano threefolds with pseudo-index > 1 ", with Priska Jahnke and Ivo Radloff, *International Journal of Mathematics* 19, 173–191, 2008.
12. "Projective \mathbb{Q} -factorial toric varieties covered by lines", with Sandra Di Rocco, *Communications in Contemporary Mathematics* 10, 363–389, 2008.
13. "Quasi-elementary contractions of Fano manifolds", *Compositio Mathematica* 144, 1429–1460, 2008.
14. "On Fano manifolds with a birational contraction sending a divisor to a curve", *Michigan Mathematical Journal* 58, 783–805, 2009.
15. "On the Picard number of divisors in Fano manifolds", *Annales Scientifiques de l'École Normale Supérieure* 45, 363–403, 2012.
16. "On the birational geometry of Fano 4-folds", *Mathematische Annalen* 355, 585–628, 2013.
17. "Numerical invariants of Fano 4-folds", *Mathematische Nachrichten* 286, 1107–1113, 2013.
18. "On some Fano manifolds admitting a rational fibration", *Journal of the London Mathematical Society* 90, 1–28, 2014.
19. "Locally unsplit families of rational curves of large anticanonical degree on Fano manifolds", with Stéphane Druel, *International Mathematics Research Notices* 2015, 10756–10800, 2015.

20. “Rank 2 quasiparabolic vector bundles on \mathbb{P}^1 and the variety of linear subspaces contained in two odd-dimensional quadrics”, *Mathematische Zeitschrift* 280, 981-988, 2015.
21. “Fano 4-folds, flips, and blow-ups of points”, *Journal of Algebra* 483, 362-414, 2017.
22. “On the Fano variety of linear spaces contained in two odd-dimensional quadrics”, with Carolina Araujo, *Geometry & Topology* 21, 3009–3045, 2017.

Expository papers:

23. “On some numerical properties of Fano varieties”, *Bollettino dell’Unione Matematica Italiana* 7-B (8), 663–671, 2004. Talk given at the XVII Convegno dell’U.M.I., held at Milano, September 8th -13rd 2003.

Preprints:

24. “The blow-up of \mathbb{P}^4 at 8 points and its Fano model, via vector bundles on a degree 1 del Pezzo surface”, with Giulio Codogni and Andrea Fanelli, 54 pages, 2017. Mathematics e-print archive, arXiv:1707.09152.

Conference talks (selection)

- *The blow-up of \mathbb{P}^4 in 8 points and its Fano model, via moduli of vector bundles on a degree 1 del Pezzo surface*, at the workshop *Algebraic Geometry: Birational Classification, Derived Categories, and Moduli*, Oberwolfach, September 2017.
- *The blow-up of \mathbb{P}^4 in 8 points and its Fano model, via moduli of vector bundles on a degree 1 del Pezzo surface*, at the *British Algebraic Geometry meeting (BrAG)*, Cambridge (UK), September 2017.
- *On the Fano variety of linear spaces contained in two odd-dimensional quadrics*, at the workshop *Beyond Toric Geometry*, BIRS, Oaxaca (Mexico), May 2017.
- *On the birational geometry of Fano 4-folds with large second Betti number*, at the workshop *Classical Algebraic Geometry*, Oberwolfach, June 2016.
- *Constructing families of minimal rational curves with singular Variety of Minimal Rational Tangents*, at the *Winter School Rational Curves on Algebraic Varieties*, Busan, Korea, January 2016.
- *Fano 4-folds, flips, and smooth blow-ups of points*, at the conference *Classification of Projective Varieties*, Levico Terme (Trento), September 2015.
- *Parabolic vector bundles on \mathbb{P}^1 and the variety of linear subspaces contained in two odd-dimensional quadrics*, at the *ISAAC 2015 - 10th congress of the International Society for Analysis, its Applications and Computation - Session on Complex Geometry*, Macau, China, August 2015.
- *On the birational geometry of Fano 4-folds with large second Betti number*, at the *INdAM Italian-Korean Meeting on Algebraic Geometry 2015*, Cortona, July 2015.
- *Locally unsplit families of rational curves on Fano manifolds*, at the conference *Classical and modern algebraic Geometry*, special session of the *First Joint International Meeting RSME-SCM-SEMA-SIMAI-UMI*, Bilbao, July 2014.
- *Prime divisors and birational geometry in Fano manifolds*, at the conference *Landau-Ginzburg theory and Fano varieties*, IBS Center for Geometry and Physics, Gyeongju, Korea, May 2014.

- *Prime divisors and birational geometry in Fano manifolds*, at the conference *Classification of Algebraic Varieties and related topics*, Cetraro, September 2013.
- *Numerical invariants of Fano varieties*, at the conference *GAEL XX+*, Grenoble, June 2012.
- *A new invariant of Fano manifolds*, at the *Workshop on algebraic surfaces and related topics*, Poitiers, October 2011.
- *A new invariant of Fano manifolds*, at the *3rd Summer Workshop on Algebraic Geometry*, Tuebingen, July 2011.
- *On the birational geometry of Fano 4-folds*, at the *Workshop on MMP and Shokurov's ACC conjecture*, Trento, July 2010.
- *On the Picard number of divisors in Fano manifolds*, at the conference *After Carnival: an Algebraic Geometry Party*, Torino, February 2010.
- *Fano varieties with large Picard number*, at the *Workshop on birational automorphism groups and birational geometry*, Centro De Giorgi, Pisa, October 2008.
- *Almost Fano threefolds with pseudo-index > 1* , at the workshop *Birational Geometry of Varieties*, Pisa, May 2006.
- *On covering and 'quasi-unsplit' families of rational curves*, at the conference *AGaFe - Geometry of Algebraic Varieties*, Ferrara, June 2005.
- *The maximal Picard number of a toric Fano variety*, at the *Joint BeNeLuxFra Conference in Mathematics - Joint meeting of the Belgian, Dutch, Luxembourg and French Mathematical Societies*, Gent (Belgium), May 2005.
- *The maximal Picard number of a toric Fano variety*, at the *Workshop on resolution of singularities, factorization of birational mappings, and toroidal geometry*, Banff (Canada), December 2004.
- *Una proprietà numerica delle varietà di Fano*, at the *XVII Convegno dell'Unione Matematica Italiana*, Milano, September 2003.
- *Contrazioni di varietà toriche di Fano*, at the *Conference Giornate di Geometria Algebrica ed Argomenti Correlati - VI*, Anacapri (Italy), May 2002.
- *Variétés toriques de Fano et diviseurs invariants*, at the conference *Géométrie Algébrique Complexe*, C.I.R.M., Marseille, December 2001.

Seminar talks (selection)

- *The blow-up of \mathbb{P}^4 in 8 points and its Fano model, via moduli of vector bundles on a degree 1 del Pezzo surface*, Institut Fourier, Grenoble, October 2017.
- *Locally unsplit families of rational curves on Fano manifolds*, Max Planck Institute for Mathematics, Bonn, April 2014.
- *Fano varieties with large second Betti number*, Laboratoire J.A. Dieudonné, Nice, January 2014.
- *Fano varieties with large second Betti number*, Ludwig-Maximilians University, Munich, April 2010.
- *Sur le nombre de Picard des diviseurs d'une variété de Fano*, Institut de Mathématiques de Jussieu, Paris, October 2009.

- *Fano varieties with large Picard number*, University of Cologne, October 2007.
- *Fano varieties with large Picard number*, Freie Universität Berlin, July 2007.
- *Variétés toriques couvertes par des droites dans l'espace projectif* and *Variétés presque Fano de dimension 3 et de pseudo-indice > 1* , Institut Fourier, Grenoble, June 2006.
- *On covering and 'quasi-unsplit' families of curves*, Royal Institute of Technology (KTH), Stockholm, May 2006.
- *On covering and quasi-unsplit families of rational curves*, University of Bayreuth, April 2005.
- *On some numerical properties of Fano varieties*, Royal Institute of Technology (KTH), Stockholm, November 2004.
- *Contractible classes in the Mori cone of toric varieties*, University of Cambridge, February 2002.
- *Toric Mori theory and contractions to non-projective varieties*, University of Warwick, January 2002.
- *Variétés toriques de Fano et diviseurs invariants*, Institut Fourier, Grenoble, October 2001.
- *Géométrie birationnelle des variétés toriques de Fano, d'après Sato*, Institut Fourier, Grenoble, March 2001.

Other information

- *Abilitazione Scientifica Nazionale* for Full Professor in Geometry and Algebra, achieved on 24/12/2013.

Teaching activity

Undergraduate courses

- *University of Turin*:
 - 2016-2017, 2015-2016, *Algebraic Geometry* (48 h), Master in Mathematics.
 - 2016-2017, *Geometry 3* (48 h), Corso di Laurea in Matematica (second year).
 - 2017-2018, 2016-2017, exercise sessions for *Geometry 2* (24 h), Corso di Laurea in Matematica (second year).
 - 2015-2016, 2014-2015, and 2011-2012, *Geometry 1* (72 h), Corso di Laurea in Matematica (first year).
 - 2014-2015, *Geometria Superiore* (40 h), Master in Mathematics.
 - 2013-2014, *Algebraic Topology* (24 h), Master in Mathematics.
 - 2013-2014, *Geometry 1* (48 h), Corso di Laurea in Matematica (first year).
 - 2012-2013, *Geometry 1* (56 h), Corso di Laurea in Matematica (first year).
 - 2012-2013 and 2011-2012, *Algebraic Topology* (48 h), Master in Mathematics.
- *University of Pavia*:
 - 2009-2010, *Algebraic Curves and Riemann Surfaces* (24 h), Master in Mathematics.
 - 2008-2009 and 2009-2010, *Geometry B* (42 h), Corso di Laurea in Matematica (second year).

- 2008-2009, *Algebraic Geometry* (30 h), Master in Mathematics.
- 2007-2008, *Algebraic Geometry* (60 h), Master in Mathematics.
- *University of Pisa:*
 - 2006-2007, *Introduction to Algebraic Geometry* (45 h), Corso di Laurea in Matematica (third year).
 - 2006-2007, *Topology and Complex Analysis* (30 h), Corso di Laurea in Matematica (second year).
 - 2005-2006, exercise sessions for *Topology and Complex Analysis* (30 h), Corso di Laurea in Matematica (second year).
 - 2005-2006, 2004-2005, and 2003-2004, exercise sessions for *Differential Geometry and Topology* (30 h), Corso di Laurea in Matematica (second or third year).
 - 2004-2005 and 2003-2004, exercise sessions for *Algebra* (20 h), Corso di Laurea in Informatica (first year).
- *University of Roma Tre:* 2002-2003 and 2003-2004, teaching assistant for *Algebraic Geometry*, Master in Mathematics.

Advanced courses

- PhD course *Birational geometry of algebraic varieties* (26 h), University of Turin, September-October 2014.
- Minicourse *Mori dream spaces and Fano varieties* (3 lectures), Institut de Recherche Mathématique Avancée, Strasbourg, January 2013.
- Minicourse *Mori dream spaces and Fano varieties* (3 lectures), at the conference *Géométrie Algébrique et Géométrie Complexe*, C.I.R.M., Marseille, March 2012.
- *Summer School PRAGMATIC*, University of Catania. Assistant of Lucia Caporaso and Olivier Debarre, together with Gianluca Pacienza and Mihai Păun, 25/8/2004 - 15/9/2004.

Students

- *Undergraduate Students:*
 - Enrica Mazzon, thesis: *CW-complexi e classificazione delle 1-varietà*, July 2013, University of Turin.
 - Davide Spriano, thesis: *Il teorema di Seifert-van Kampen: presentazione e applicazioni*, July 2014, University of Turin.
 - Gioele Gallo, thesis: *Il teorema della curva di Jordan nel piano e sulle superfici*, July 2017, University of Turin.
 - (*in progress*) Marco Umbrello, Fabio Buccoliero, Matteo Durante.
- *Master Students:*
 - Gloria Della Noce, thesis: *La costruzione dello spazio dei moduli delle curve di genere 2 tramite la teoria degli invarianti*, September 2009, University of Pavia.
 - Emanuele Raviolo, thesis: *Risultati di finitezza per famiglie di varietà di Fano*, September 2009, University of Pavia.

- Valeriano Lanza, thesis: *Varietà di Kähler compatte con fibrato canonico banale*, September 2010, University of Pavia.
- Simone Buffa, thesis: *Aspetti della congettura di Hodge: classi di Hodge intere e 1-cicli*, October 2013, University of Turin.
- Laura Pertusi, thesis: *Proprietà dell'algebra coomologica delle varietà di Kaehler*, July 2014, University of Turin.
- Vincenzo Antonelli, thesis: *Proprietà topologiche di ipersuperfici proiettive*, April 2016, University of Turin.
- Luca Viappiani, thesis: *Esempi e applicazioni delle sequenze spettrali di Leray*, July 2016, University of Turin.
- (in progress) Francesca Porciello.
- *Ph.D. Students:*
 - Anna Scaramuzza, University of Roma Tre, cotutored with Lucia Caporaso. Thesis: *Smooth complete toric varieties: an algorithmic approach*, defended on 17/4/2007.
 - Gloria Della Noce, University of Pavia. Thesis: *Singular Fano varieties: results on their Picard number*, defended on 20/12/2012.
 - Eleonora Romano, University of Turin. Thesis: *Non-elementary Fano conic bundles*, defended on 20/3/2017.

Administration and responsibilities

University service

- *University of Turin:*
 - Since 2015, member of the [scientific committee](#) of the Mathematics Department.
 - Since January 2013, member of the [scientific board](#) of the Ph.D. in Mathematics.
 - Since November 2012, member of the [board of the Bachelor and Master in Mathematics](#).
 - Co-organizer of the [Algebraic Geometry Seminar](#) of the Mathematics Departments of the University of Turin.
- *University of Pavia:*
 - 1/11/2009 - 27/1/2011, member of the scientific board of the Ph.D. in Mathematics and Statistics.
- *University of Pisa:*
 - 2005 and 2006: co-organizer of the Algebraic Geometry Seminar at the Mathematics Department.
 - 1/11/2004 - 31/10/2006: member of the Scientific Committee for the area “Scienze matematiche e informatiche”.

Commissions of trust

- Referee for the journals:
Advances in Geometry, Advances in Mathematics, Annales de l'Institut Fourier (Grenoble),

Annali della Scuola Normale Superiore di Pisa, Canadian Mathematical Bulletin, Central European Journal of Mathematics, Communications in Algebra, Compositio Mathematica, Comptes Rendus de l'Académie des Sciences (Paris), Discrete and Computational Geometry, Duke Mathematical Journal, Geometriae Dedicata, International Journal of Algebra and Computation, International Mathematics Research Notices, Journal of Pure and Applied Algebra, Journal of the European Mathematical Society, Journal of the London Mathematical Society, Manuscripta Mathematica, Mathematische Annalen, Mathematische Nachrichten, Mathematische Zeitschrift, Michigan Mathematical Journal, Rendiconti dell'Istituto di Matematica dell'Università di Trieste, Rendiconti del Seminario Matematico - Università e Politecnico di Torino, Rendiconti Lincei: Matematica e Applicazioni, Research in the Mathematical Sciences, SIAM Journal on Applied Algebra and Geometry (SIAGA), Transactions of the American Mathematical Society.

- Referee and member of the Committee for the Ph.D. thesis defense of Pedro Montero, Institut Fourier (Grenoble), October 2017.
- Member of the Selection Committee for a position of *Ricercatore a tempo determinato, tipo A* in Geometry, University of Padova, 2017.
- Member of the Selection Committee for a position of *Ricercatore a tempo determinato, tipo A* in Geometry, University of Milano Bicocca, 2016.
- Member of the Selection Committee for 3 Post-doc research fellowships in Mathematics, University of Turin, Mathematics Department, February 2016.
- Member of the evaluation panel of the [Mathematics Department of the University of Nantes](#) (France), for the French Agency of Evaluation of Research (HCERES), January 2016.
- Referee and member of the Committee for the *Habilitation à Diriger des Recherches* of [Boris Pasquier](#), University of Montpellier, November 2015.
- Member of the Selection Committee for a position of *Maître de Conférences* in Mathematics at the Institut Fourier, Grenoble, April-May 2015.
- Referee for the Italian VQR 2011-2014 (2016).
- Referee for the INdAM COFUND-2012 fellowship program (April 2015).
- Referee for the SIR 2014 program (November 2014).
- Member of the Committee for the admission to the Ph.D. in Pure and Applied Mathematics, Politecnico and University of Turin, October 2014.
- Member of the Committee for the Post-doc research fellowship *Algebra and algebraic geometry*, University of Turin, Mathematics Department, September 2014.
- Member of the Committee for the Post-doc research fellowship *Moduli problems in complex algebraic geometry*, University of Milan, Mathematics Department, June 2014.
- Member of the Committee for the Ph.D. Final Exam (Thesis Defense) of Sara Angela Filippini, University of Insubria, February 2013.
- Member of the Committee for the admission to the Ph.D. in Mathematics and Statistics, University of Pavia, October 2008.

Organisation of scientific meetings

- Co-organizer of the [School in Deformation Theory](#), 5-8 July 2017, Torino.

- Co-organizer of *Algebraic Geometry in Torino*, a conference on the occasion of Alberto Collino's retirement, 4-5 February 2016.
- Co-organizer of the research school *ELGA II - II Latin American School of Algebraic Geometry and Applications*, CIMPA - IMPA, Cabo Frio (RJ), Brazil, 1-12 June 2015.
- Organizer, with Alberto Albano, of the *MiniWorkshop in Algebraic Geometry*, 2-3 February 2015, University of Turin.
- Organizer, with Letterio Gatto and Angelo Lopez, of the conference *Giornate di Geometria Algebrica e argomenti correlati, XII*, Politecnico of Turin, 4-7 June 2014.

Research projects and grants

- Coordinator of the Research Project "Geometria Algebrica", University of Turin, in 2012 and 2014-present.
- Coordinator of the Research Project "Geometria delle varietà – aspetti algebrici e differenziali", University of Turin, 2013.
- Participant in the Research Project M.I.U.R. PRIN-Cofin 2009 "Spazi di moduli e teoria di Lie", group of Pavia. Local coordinator Gian Pietro Pirola, national coordinator Corrado De Concini (University of Roma "La Sapienza").
- Participant in the Research Project M.I.U.R. PRIN-Cofin 2006 "Geometria delle varietà algebriche e dei loro spazi di moduli", group of Pisa. Local coordinator Rita Pardini, national coordinator Alessandro Verra (University of Roma Tre).
- Participant in the Research Project INDAM 2005 "Birational Geometry of Projective Varieties". Coordinator Angelo Lopez (University of Roma Tre).
- Participant in the Research Project M.I.U.R. PRIN-Cofin 2004 "Geometria sulle varietà algebriche", group of Pisa. Local coordinator Rita Pardini, national coordinator Alessandro Verra (University of Roma Tre).