

Antonino Ficarra

Curriculum Vitae

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Date of Birth: 20 February 1997

🌐 scholar.google.com/22QGr8gAAAAJ&hl=en

Research Interest

Commutative Algebra, Algebraic Combinatorics, Algebraic Geometry, Graph Theory, Coding.

Professional Experience

- Sep 2023 **Visiting Researcher**, *Universität Duisburg-Essen*, Germany, guest of Prof. Jürgen Herzog.
- May 2023 **Visiting Researcher**, *Universität Duisburg-Essen*, Germany, guest of Prof. Jürgen Herzog.
- Sep 2022 - Nov 2022 **Visiting Researcher**, *Universität Duisburg-Essen*, Germany, guest of Prof. Jürgen Herzog.
- Nov 2020 - Nov 2023 **PhD Student**, *Joint program of the Universities of Catania, Palermo and Messina*, Italy, advisor Prof. Marilena Crupi, co-advisor Prof. Jürgen Herzog.

Education

- Nov 2020 - 17 Nov 2023 **PhD in Mathematics, Doctor Europeus**, *Joint program of the Universities of Catania, Messina and Palermo*, Università degli Studi di Messina, Italy, obtained on November 17th 2023 with a thesis in Commutative Algebra entitled *Multigraded Syzygies of Monomial Ideals*, advisor Prof. Marilena Crupi, co-advisor Prof. Jürgen Herzog, final grade: excellent with laude.
- Sep 2018 - 24 Jul 2020 **Master's Degree in Mathematics**, Università degli Studi di Messina, Italy, with a thesis in Commutative Algebra entitled *A special class of monomial ideals: the t -spread ideals*, advisor Prof. Marilena Crupi, final grade 110/110 cum laude.
- Sep 2015 - 25 Jul 2018 **Bachelor's Degree in Mathematics**, Università degli Studi di Messina, Italy, with a thesis in Commutative Algebra entitled *Gröbner bases and zero-dimensional ideals*, advisor Prof. Rosanna Utano, final grade 110/110.

Teaching Experience at university level

- Sep 2023 - Nov 2023 **Teaching Assistant**, for the course of *Algebra II*, Università degli studi di Messina, Italy, Prof. Marilena Crupi, 10 hours.
- Sep 2021 - May 2022 **Teaching Assistant**, for the course of *Algebra II*, Università degli studi di Messina, Italy, Prof. Marilena Crupi, 30 hours.

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- May 2021 - Dec 2021 **Teaching Assistant**, for the course of *Istituzioni di Matematiche e Metodi Statistici*, Università degli studi di Messina, Italy, Prof. Patrizia Rogolino, 60 hours.
- 15-22 Sep 2021 **Lecturer**, for the mini-course *Corso di azzeramento in Matematica di base per gli iscritti in Matematica, Anno Accademico 2021-2022*, Università degli studi di Messina, Italy, 30 hours.
- Jan 2020 - Dec 2020 **Part-time Collaboration**, supervising 4 DSA students, Università degli studi di Messina, Italy, 200 hours.
- Jan 2019 - Jun 2019 **Didactics training programm (Percorso Formativo 24 CFU)**, Università degli Studi di Messina, four courses with final exams on pedagogy, psychology and didactics of Mathematics.
- Feb 2018 - Nov 2018 **Part-time Collaboration**, supervising 1 DSA student, Università degli studi di Messina, Italy, 150 hours.

Other teaching experience

- Nov 2023 - **High School Teacher** in Mathematics at Istituto Duca Abruzzi Libero-Grassi, Palermo, Italy.

Publications and Preprints

- (30) **Antonino Ficarra**, *Dao numbers and the asymptotic behaviour of fullness*, 2024, in preparation.
- (29) David Eisenbud, **Antonino Ficarra**, Jürgen Herzog and Somayeh Moradi. *Ideals and their Fitting ideals*. (2023), preprint arxiv.org/abs/2401.00541.
- (28) **Antonino Ficarra** and Emanuele Sgroi. *vNumber: Macaulay2 Package*. (2023), preprint.
- (27) **Antonino Ficarra**. *Shellability of componentwise discrete polymatroids*. (2023), preprint arxiv.org/abs/2312.13006.
- (26) **Antonino Ficarra**. *MatchingPowers: Macaulay2 Package*. (2023), preprint arxiv.org/abs/2312.13007.
- (25) Nursel Erey and **Antonino Ficarra**. *Matchings powers of monomial ideals and edge ideals of weighted oriented graphs*. (2023), preprint arxiv.org/abs/2309.13771.
- (24) **Antonino Ficarra**. *HomologicalShiftIdeals: Macaulay2 Package*. (2023), preprint arxiv.org/abs/2309.09271.
- (23) **Antonino Ficarra**. *Simon Conjecture and the v-number of monomial ideals*. (2023), preprint arxiv.org/abs/2309.09188.
- (22) **Antonino Ficarra**, Jürgen Herzog and Somayeh Moradi. *The eventual shape of the Betti table of $\mathfrak{m}^k M$* . (2023), preprint arxiv.org/abs/2308.00639v4.
- (21) **Antonino Ficarra** and Emanuele Sgroi. *Asymptotic Behaviour of the v-number of homogeneous ideals*. (2023), preprint arxiv.org/abs/2306.14243v4.
- (20) **Antonino Ficarra**, Jürgen Herzog and Dumitru I. Stamate. *The toric ring of one dimensional simplicial complexes*. (2023), preprint arxiv.org/abs/2306.05020.
- (19) Marilena Crupi and **Antonino Ficarra**. *Very well-covered graphs via the Rees algebra*. (2023), preprint arxiv.org/abs/2305.01448v3.

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- (18) **Antonino Ficarra** and Giancarlo Rinaldo. *Matematica e Crittografia*, La comunicazione della scienza. Tributo in onore di Piero Angela, Messina University Press, (2023).
- (17) Marilena Crupi, **Antonino Ficarra** and Ernesto Lax. *Matchings, Squarefree powers and Betti splittings*. (2023), preprint arxiv.org/abs/2304.00255.
- (16) Marilena Crupi, **Antonino Ficarra** and Ernesto Lax. *Mapping cones of monomial ideals over exterior algebras*. (2023), preprint arxiv.org/abs/2303.06953.
- (15) Marilena Crupi, **Antonino Ficarra** and Ernesto Lax. *Macaulay's theorem for vector-spread algebras*. (2023), preprint arxiv.org/abs/2302.07595v2.
- (14) **Antonino Ficarra** and Emanuele Sgroi. *The size of the Betti table of binomial edge ideals*. (2023), preprint arxiv.org/abs/2302.03585.
- (13) **Antonino Ficarra**, Jürgen Herzog, Dumitru I. Stamate and Vijayalaxmi Trivedi. *The canonical trace of determinantal rings*, (2022), preprint arxiv.org/abs/2212.00393.
- (12) Marilena Crupi and **Antonino Ficarra**. *Very well-covered graphs by Betti splittings*. *Journal of Algebra* 629(2023): 76–108.
- (11) **Antonino Ficarra** and Jürgen Herzog. *Dirac's theorem and multigraded syzygies*. *Mediterranean Journal of Mathematics* (2023), 20:134.
- (10) **Antonino Ficarra**, Jürgen Herzog and Takayuki Hibi. *Behaviour of the Normalized Depth Function*. *The Electronic Journal of Combinatorics* (2023): P2-31.
- (9) **Antonino Ficarra**. *Homological shifts of polymatroidal ideals*, (2022), preprint arxiv.org/abs/2205.04163v2.
- (8) **Antonino Ficarra** and Marilena Crupi. *A note on minimal resolutions of vector-spread Borel ideals*. *Analele Stiintifice ale Universitatii Ovidius Constanta: Seria Matematica*, 31(2), (2023).
- (7) Marilena Crupi and **Antonino Ficarra**. *Linear resolutions of t -spread lexsegment ideals via Betti splittings*, *Journal of Algebra and Its Applications* (2023): 2450072.
- (6) **Antonino Ficarra**. *Vector-spread monomial ideals and Eliahou–Kervaire type resolutions*, *Journal of Algebra* 615(2023): 170-204.
- (5) Marilena Crupi and **Antonino Ficarra**. *Classification of Cohen–Macaulay t -spread lexsegment ideals via simplicial complexes*. *Illinois Journal of Mathematics*, 66(4), (2022), 565-594.
- (4) **Antonino Ficarra** and Marilena Crupi. *Shifting operations and completely t -spread lexsegment ideals*. *Communications in Algebra* 50(8) (2022), 3320–3337.
- (3) Luca Amata, Marilena Crupi and **Antonino Ficarra**. *Projective dimension and Castelnuovo–Mumford regularity of t -spread ideals*, *International Journal of Algebra and Computation*, 2022, 32(4), pp. 837–858.
- (2) Luca Amata, **Antonino Ficarra** and Marilena Crupi. *A numerical characterization of the extremal Betti numbers of t -spread strongly stable ideals*. *Journal of Algebraic Combinatorics* (2022): 1-28.
- (1) Luca Amata, Marilena Crupi and **Antonino Ficarra**. *Upper bounds for extremal Betti numbers of t -spread strongly stable ideals*. *Bulletin mathématique de la Société des Sciences Mathématiques de Roumanie*, Tome 65 (113), No. 1, 2022, 13–34.

Invited Talks (Selected)

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- 26 Jun 2023 28th National School on Commutative Algebra, Interactions between Algebra and Geometry in Bucharest, Romania.
- 21 Feb 2023 Seminari di Algebra, Università degli studi di Messina, Italy.
- 8 Aug 2022 EMS Summer School on Combinatorial Commutative Algebra, Gebze, Turkey.
- 1 Aug 2022 Seminari di Algebra, Università degli studi di Messina, Italy.
- 1 Jun 2022 Seminari di Algebra, Università degli studi di Messina, Italy.

Workshops and schools (selected to participate or invited)

- 25-26 Nov 2023 Advances in Ring Theory and Applications, online.
- 23-24 Nov 2023 Algebraic Geometry, Computational Commutative Algebra, Groebner Bases and Quantum Codes, online.
- 14 Nov 2023 Nuovi Modelli per l'Insegnamento delle Scienze, Università degli studi di Messina, Italy.
- 2 Aug 2023 Seminari di Crittografia, Università degli studi di Messina, Italy.
- 20 Jul 2023 *On Depth and Regularity of Powers of Binomial Edge Ideals of Graphs*, Zhongming Tang, Università degli studi di Reggio Calabria, Italy.
- 6 Jul 2023 Cento Anni di UMI, Università degli studi di Messina, Italy.
- 24-28 Jun 2023 28th National School on Commutative Algebra, Interactions between Algebra and Geometry in Bucharest, Romania.
- 8 May 2023 Seminario di Crittografia, Università degli studi di Messina, Italy.
- 23 Feb 2023 *Macaulay's Theorem and additive combinatorics*, Shalom Eliahou, Università degli studi di Reggio Calabria, Italy.
- 21 Feb 2023 Seminari di Algebra, Università degli studi di Messina, Italy.
- 29 Mar 2023 Matematica e Crittografia, co-organized with Prof. Giancarlo Rinaldo, Università degli studi di Messina, Italy.
- 11 Nov 2022 *Rings of invariants for some three dimensional modular representations*, Vijaylaxmi Trivedi. Universität Duisburg-Essen, Germany.
- 3-17-24 Nov 2022 *Grothendieck-Lefschetz and Noether-Lefschetz for the divisor class group I-II-III*, Vasudevan Srinivas. Universität Duisburg-Essen, Germany.
- 8-13 Aug 2022 EMS Summer School on Combinatorial Commutative Algebra, Gebze, Turkey.
- 1 Aug 2022 Seminari di Algebra, Università degli studi di Messina, Italy.
- 13-17 Jun 2022 75+80=155 years of commutative algebra, Osnabröck, Germany.
- 1 Jun 2022 Seminari di Algebra, Università degli studi di Messina, Italy.
- 23-27 May 2022 100 years Unione Matematica Italiana - 800 years Università di Padova, Padova, Italy.
- 18 May 2023 Open Day, Università degli studi di Messina, Italy.

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- 12 May 2022 One day on the Algebraic-Geometric Nature of Varieties, online.
- 2-27 May 2022 De Cifris Trends in Modern Cryptography, Università degli studi di Trento, Italy.
- 27 Apr 2022 Giornata della Matematica, Università degli studi di Messina, Dipartimento Mift, Italy.
- 19 Jul - 13 Aug 2021 Summer School SMI 2021, Italy.

Technical skills

- Programming **C++**, **Python** (numpy, pandas, scikit-learn, matplotlib).
- Scientific **Macaulay2**, **Normalitz**, **CoCoA**, **Maple**, **GeoGebra**, **Sage**, **Matlab**.
- Development **HomologicalShiftIdeals**, **MatchingPowers**, **VNumber**, packages for the computer algebra system **Macaulay2**.
- OS Microsoft Windows, Linux/Unix.
- Typography **Office**, **L^AT_EX**.

Languages

Italian (native), **English**.

Responsibilities, Awards and Interests

- **Mentoring** the PhD student Ernesto Lax (Mathematics and Computational Sciences, Joint program of the universities of Catania, Messina and Palermo, Cycle XVIII).
- **Co-supervisor** for the Master's thesis of Salvatore Rotuletti titled *Proprietà combinatoriche di grafi bipartiti*, (14/12/2022), Università degli studi di Messina, Italy.
- **Co-supervisor** for the Bachelor's thesis of Marco Romeo titled *Risoluzioni minimali di particolari classi di ideali squarefree*, (14/10/2021), Università degli studi di Messina, Italy.
- **Co-organizer** of the workshop *Matematica e Crittografia*, (29 March 2023) Università degli studi di Messina, Italy.
- **Co-organizer** of the workshop *Giornata della Matematica*, (27 April 2022), Università degli studi di Messina, Dipartimento Mift, Italy.
- **Reviewer** for the journals: Journal of Algebra, Journal of Algebra and its Applications, Communications in Algebra, International Journal of Algebra and Computation, Journal of Pure and Applied Algebra, Journal of Algebraic Combinatorics, Mathematics, European Journal of Combinatorics, Electronic Journal of Combinatorics, Journal of Combinatorial Theory Series A, Nagoya Mathematical Journal, Collectanea Mathematica, Bulletin of the Australian Mathematical Society, Journal of Software in Algebra and Geometry. Reviewer for ZBMath in 2020-2022.
- Member of the *Italian National Group for Algebraic and Geometric Structures, and their Applications* (GNSAGA - INDAM) 2021-2023.
- Winning the award *Onore al merito* (2018), Università degli studi di Messina, Italy.
- Winning the award *Fondo sostegno giovani* (2018), Università degli studi di Messina, Italy.
- Eligibility for the Contest for 40 scholarships for degree courses in Mathematics 2018-2019, organized by the *Istituto Nazionale di Alta Matematica "Francesco Severi"* (INdAM).
- Interested in the popularization and the dissemination of Science, Mathematics and in particular, of Commutative Algebra and Combinatorics.

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