

Giuseppe Cotardo

Postdoctoral Fellow

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RESEARCH INTERESTS

Codes in the rank and tensor metrics, zeta functions, algebraic bilinear complexity, posets, geometric lattices, asymmetric channels.

GENERALITIES

Nationality: Italian

Languages: English (fluent), Italian (native)

EDUCATION

Ph.D. in Mathematics, University College Dublin, Ireland, June 2022.

Dissertation: “Invariants of Tensor Codes: Generalized Weights, Zeta Functions and Tensor Rank”.

Advisor: Eimear Byrne.

Co-Advisor: Alberto Ravagnani (October 2018 - December 2019).

M.Sc. in Mathematics, University of Trento, Italy, March 2018.

Dissertation: “ \mathbb{F}_{q^n} -linear Twisted Gabidulin Codes: Structure and Decoding”.

Grade: 110/110 cum laude.

Advisors: Edoardo Ballico, Eimear Byrne, Alberto Ravagnani.

B.Sc. in Mathematics, University of Turin, Italy, October 2015.

Dissertation: “Finite Fields and Hermitian Codes”.

Grade: 100/110.

Advisors: Chiara Marcolla, Margherita Roggero

APPOINTMENTS

Postdoctoral Fellow, Virginia Tech, Virginia, USA, August 2022 - present

RESEARCH VISITS

INRIA, Saclay-Île-de-France, France, September 2021 - December 2021

University College Dublin, Dublin, Ireland, September 2017 - December 2017

AWARDS, PRIZES AND GRANTS

10. International Postdoctoral Fellowship, University of St. Gallen [CHF 175,308], May 2022 - *declined*.
9. Seed Funding - Dissemination and Outputs, UCD Research Office [€ 1,320], March 2022.

8. Ranked 1st in the Research Student Competition of the the 33rd annual meeting of the Irish Mathematical Society, hosted online by DCU, January 2021.
7. Learning Enhancement Project Grant 2019-2020 (with E. Byrne), UCD Teaching & Learning [€ 1,800], January 2020.
6. Learning Enhancement Project Grant 2019-2020 (with P. Mellon), UCD Teaching & Learning [€ 2,118], January 2020.
5. Merit Award - 2018, Prize of University of Trento (Italy) for academic records [€ 2,029], June 2019.
4. Government of Ireland Postgraduate Scholarship, Irish Research Council [€ 102,124.86], September 2018.
3. ERASMUS+ Programme, European grant for international mobility, May 2017.
2. Ranked 1st in “Digital Signature awareness contest”, organized by the CryptoLabTN¹ in collaboration with Clusit² during the Cryptoweek 2016. The event is organized within the framework of the European Cyber Security Month (ECSM), October 2016.
1. Ranked 1st in “ECC awareness contest”, organized by the CryptoLabTN¹ in collaboration with Clusit² during the Cryptoweek 2015. The event is organized within the framework of the European Cyber Security Month (ECSM), October 2015.

PROFESSIONAL TRAINING

- Completed the “Epigeum Research Integrity Training”, September 2020.

PUBLICATIONS AND PREPRINTS

5. **Rank-Metric Lattices** (with A. Ravagnani)
Submitted. arXiv: [2206.09284](https://arxiv.org/abs/2206.09284).
4. **Invariants for Tensor Codes** (with E. Byrne)
Submitted. arXiv: [2112.08100](https://arxiv.org/abs/2112.08100).
3. **Bilinear Complexity of 3-Tensors Linked to Coding Theory** (with E. Byrne)
Submitted. arXiv: [2103.08544](https://arxiv.org/abs/2103.08544).
2. **Parameters of Codes for the Binary Asymmetric Channel** (with A. Ravagnani)
IEEE Transactions on Information Theory, 68.5 (2022), pp. 2941-2950..
1. **Generalized Rank Weights, Binomial Moments and Zeta Functions** (with E. Byrne, A. Ravagnani)
Linear Algebra and its Applications, 604 (2020), pp. 92-128.

RESEARCH TALKS

(invited talks are marked with an asterisk)

12. **Rank-Metric Lattices**
Summer School “ACT22”, Zurich, Switzerland, July 2022.
11. **Rank-Metric Lattices ***
Conference “ILAS 2022”, Galway, Ireland, June 2022.
10. **Tensor Codes: Invariants and Extremality ***
Seminar “Algebra Seminar”, University of Kentucky, Lexington, Kentucky, USA (Hosted online), March 2022.

¹Laboratory of Cryptography at University of Trento (Italy).

²The Italian Association for Computer Security.

9. **Tensor Codes and their Invariants** *

Seminar “Discrete Mathematics, Codes and Cryptography Seminar”, University Paris 8 - LAGA, Paris, France, December 2021.

8. **Bilinear Complexity of 3-Tensors Linked to Coding Theory** *

Seminar “GT Équipe GRACE”, Inria Saclay-Île-de-France, France, November 2021.

7. **Invariants for Matrix Codes: a Tensor Algebra Approach** *

Seminar “Grace Young Seminar”, Inria Saclay-Île-de-France, France, October 2021.

6. **Parameters of Codes for the Binary Asymmetric Channel** *

Seminar “Arbeitsgemeinschaft in Codierungstheorie und Kryptographie”, (Hosted online), October 2021.

5. **Codes for the Binary Asymmetric Channel**

Conference “Cryptography and Coding Theory - First annual Meeting”, (Hosted online), September 2021.

4. **Bilinear Complexity of 3-Tensors Linked to Coding Theory**

e-Summer School “ACT21”, Zurich, Switzerland (Hosted online), June 2021.

3. **Bilinear Complexity of 3-Tensors Linked to Coding Theory**

Seminar “UCD School of Maths and Stats Postgraduate Seminar Series 2021”, University College Dublin, Dublin, Ireland, March 2021.

2. **Zeta Function for Generalized Rank Weights** *

Conference “SIAM AG19”, Bern, Switzerland, July 2019.

1. **Zeta Function for Generalized Rank Weights**

Summer School “Finite Geometry and Friends”, Brussel, Belgium, June 2019.

PROFESSIONAL EXPERIENCE

- Reviewer for the scientific journals IEEE Transaction on Information Theory and Linear Algebra and Its Applications.
- Reviewer for the conference “Cryptography and Coding Theory”.
- Organizer of scientific events:
 - Organizer, jointly with John Sheekey, of the “UCD School of Mathematics and Statistics Postgraduate Workshop” for PhD students of the UCD School of Mathematics and Statistics, May 2022.
 - Organizer, jointly with Anina Gruica, of the virtual seminar “PICS (Postgraduate International Coding Theory Seminar)” for PhD students and early-stage postdocs, from June 2021.
 - Organizer, jointly with Eimear Byrne, of the workshop “MAGMA for Coding Theory” for master students of the University College Dublin, March 2019.

MENTORING EXPERIENCE

- Padraig Ryan (BSc student), January 2022 - May 2022, (co-advised with E. Byrne).

TEACHING EXPERIENCE

- **University College Dublin**, October 2018 - July 2022.
Tutor for the following courses: Combinatorics and Number Theory, Linear Algebra I, Mathematics for Computer Science II, Differential Geometry, Matrix Algebra, Introduction to Calculus for Engineers, Coding Theory.

PUBLIC ENGAGEMENT

- In May 2022, I collaborated with the UCD School of Mathematics and Statistics Outreach Committee in organizing an event for postgraduate students and postdocs in UCD to celebrate the International Day of Women in Mathematics.
- In April 2021, I gave an informative talk as part of the TY Careers Week at the all-girl secondary school Loreto College Foxrock, Dublin (Ireland). This initiative was addressed to secondary-school students in their transition year.
- In October 2019, I volunteered in facilitating activities as part of Maths Week in UCD (Ireland). These activities were addressed to primary-school students in the form of games and puzzles.
- In March 2015, I was responsible of a geometry lab coordinated by Prof. Giorgio Ferrarese at the Department of Mathematics of the University of Turin (Italy), as part of the program “Bambine e Bambini. Un giorno all’Università”, organized by Agorà Scienza. This project aimed at helping primary school children discover the mathematical research world.

MEMBERSHIPS

- Member of the UCD Enumerative Combinatorics group, October 2020 - present.
- Member of the UCD Applied Algebra group, October 2020 - present.
- Nominated student member of SIAM, August 2019 - present.
- Member of Clusit², 2016 - 2019.
Awarded for the “Digital Signature awareness contest” and the “ECC awareness contest”.

PARTICIPATION TO INTERNATIONAL CONFERENCES AND SCHOOLS

(invited-only events are marked with an asterisk)

14. Summer School “ACT22”, Zurich, Switzerland, July 2022.
13. Conference “ILAS 2022”, Galway, Ireland, June 2022.
12. Workshop “Algebraic Methods in Coding Theory and Communication”. Banff-Oaxaca, Mexico (Hosted online), April 2022.
11. Cryptography and Coding Theory - First annual Meeting. (Hosted online), September 2021.
10. SIAM AG21 Conference on Applied Algebraic Geometry. Texas, USA (Hosted online), August 2021.
9. Combinatorial Designs and Codes. Rijeka, Croatia (Hosted online), July 2021.
8. 28th British Combinatorial Conference “BCC 2021”. Durham, England (Hosted online), July 2021.
7. e-Summer School “ACT21”. Zurich, Switzerland (Hosted online), June 2021.
6. International Workshop on Crypto and Coding Theory “IWCC-2021”. (Hosted online), March 2021.
5. 33rd annual meeting of the Irish Mathematical Society. (Hosted online), January 2021.
4. Final workshop of the Manta Project (ANR France). Nogaro en Armagnac, France, August 2019. *
3. SIAM AG19 Conference on Applied Algebraic Geometry. Bern, Switzerland, July 2019.
2. Summer School “Finite Geometry and Friends”. Brussel, Belgium, June 2019.
1. Algebraic Coding Theory for Networks, Storage, and Security. Dagstuhl, Germany, December 2018. *

SKILLS

Languages: C++ (Basic)

Programming: MAGMA (Advanced), Latex (Advanced), Singular (Good), Coq (Basic), R (Basic)

Softwares: Maple (Good), Matlab (Good), Mathematica (Good)