

GIANIRA NICOLETTA ALFARANO

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PERSONAL INFORMATION

Birthplace Noci (Bari), Italy

Birthdate 01/11/1993

Citizenship Italian

Webpage <https://user.math.uzh.ch/alfarano/>

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ArXiv ID <https://arxiv.org/a/0000-0002-7463-6365>

Researchgate https://www.researchgate.net/profile/Gianira_Alfarano

RESEARCH INTERESTS

Algebraic coding theory, combinatorics, finite geometry, applied discrete mathematics, commutative algebra, cryptography.

EDUCATION

University of Zurich, Switzerland

2018–2022

Department of Mathematics

Ph.D. student in Applied Algebra

Thesis title: “Algebraic, Combinatorial and Geometric Aspects of Some Error-Correcting Codes”

Advisor: Prof. Dr. Joachim Rosenthal

Università degli Studi di Trento, Italy

2015–2017

Master of Mathematics - Curriculum Coding Theory and Cryptography

Master degree in Mathematics *Grade: 110/110 cum Laude*

Thesis title: “The Diffusion Property of some Mixing-Layers”

Università del Salento, Lecce, Italy

2012–2015

Bachelor of Mathematics

Bachelor degree in Mathematics *Grade: 110/110 cum Laude*

Thesis title: “The classical unital”

Liceo Scientifico “Leonardo da Vinci”, Noci, Italy

2007–2012

High school

High school diploma *Grade: 100/100 cum Laude*

POSITIONS HELD

Postdoctoral Researcher

October 2022–current

Eindhoven, University of Technology

Teaching Assistant/Ph.D. student

April 2018–September 2022

University of Zurich

Advisor: Prof. Dr. Joachim Rosenthal

Research Internship

February–June 2017

Topic: Symmetric Cryptography

HORST GÖRTZ INSTITUTE FOR IT-SECURITY (HGI),

Ruhr Universität

Bochum, Germany

AWARDS AND GRANTS

Postdoc.Mobility Fellowship

October 2022 – September 2024

Funded by Swiss National Science Foundation

Grant number 210966.

amount: **106'600 CHF****UZH Alumni grant**

2022

Additional grant for the organization of the Summer School

“ACT 22: Algebraic Coding Theory”

Ph.D Mobility Fellowship

February–August 2021

Financial support from the Swiss National Science Foundation
for 6-months scientific visit

University College Dublin, Ireland.

Grant GRC 2019_Q3_G_003

2020

Grant for the organization of the Summer School

“ACT 22: Algebraic Coding Theory”

VAUZ

2020

Additional grant for the organization of the Summer School

“ACT 21: Algebraic Coding Theory”

Financed through the Swiss National Science Foundation grant no. 188430

2019 – 2022

P.I. Prof. J. Rosenthal

Oberwolfach Leibniz Graduate Student (OWLG)

March 2019

grant to participate to the

Oberwolfach Workshop 1912, Contemporary Coding Theory

Oberwolfach, Germany.

Schloss Dagstuhl - Leibniz Center for Informatics

December 2018

Invitation to participate to the seminar

“Algebraic Coding Theory for Networks, Storage, and Security” (18511), Germany.

OTHER AWARDS

Travel Grant (registration fee and accommodation)

19 February- 25 February 2023

Financial support for “Alcocypt 2023” from the local committee, CIRM, Marseille, France.

The Applications of Computer Algebra Early Researcher Award 2022**591 euros**

August 2022

<https://math.unm.edu/ACA/ACA-ERA/Overview.html>**Best presentation award: 500 euros**

July 2022

for the talk “The geometry of minimal codes”, given in the virtual summer school

“Contemporary Algebraic and Geometric Techniques in Coding Theory and Cryptography”,
Università degli Studi della Campania, Luigi Vanvitelli.

Travel Grant (registration fee)

15 August- 19 August 2022

Partial financial support for “ACA 2022” from the local committee, in Istanbul, Turkey.

Travel Grant: 500 euros

26 June- 1 July 2022

Partial financial support for “ISIT 2022” from the local committee, in Espoo, Finland.

Travel Grant (registration fee)

30 May- 3 June 2022

Partial financial support for “Combinatorics 2022” from the local committee, in Mantua, Italy.

ACADEMIC VISITS

Invited researcher at University of Zurich, Switzerland, 6-9 December, 2022.

Invited researcher at University of Paris VIII, France, November 23-December 5, 2022.

Invited researcher at University of Paris VIII, France, 5-18 September 2021.

Invited researcher at the Max Planck Institute for Mathematics in the Sciences (MiS) in Leipzig, Germany, July-August 2021.

Researcher at University College Dublin, Ireland, February–August 2021

Invited researcher at the Max Planck Institute for Mathematics in the Sciences (MiS) in Leipzig, Germany, 21-23 September 2020.

Invited researcher at the Universidad de Alicante, Alicante, Spain, May-June 2019.

Research internship at HORST GÖRTZ INSTITUTE FOR IT-SECURITY (HGI), Ruhr Universität, Bochum, Germany, February-June 2017

PUBLICATIONS IN PEER-REVIEWED JOURNALS

11. **G. N. Alfarano**, D. Napp, A. Neri, and V. Requena. Weighted Reed-Solomon Convolutional Codes. *Linear and Multilinear Algebra*, **2022**.
DOI: 10.1080/03081087.2023.2169232
10. **G. N. Alfarano**, M. Borello, A. Neri, and A. Ravagnani. Linear Cutting Blocking Sets and Minimal Codes in the Rank Metric. *Journal of Combinatorial Theory, Series A*, **2022**.
DOI: 10.1016/j.jcta.2022.105658
9. **G. N. Alfarano**, A. Gruica, J. Lieb, J. Rosenthal. Convolutional codes over finite chain rings, MDP codes and their characterization. *Advances in Mathematics of Communications*, **2022**.
DOI: 10.3934/amc.2022028
8. **G. N. Alfarano**, F.J. Lobillo, A. Neri, A. Wachter-Zeh. Sum-rank product codes and bounds on the minimum distance. *Finite Fields and their Applications*, **2022**.
DOI: 10.1016/j.ffa.2022.102013
7. **G. N. Alfarano**, M. Borello, A. Neri, and A. Ravagnani. Three Combinatorial Perspectives on Minimal Codes. *Siam Journal on Discrete Mathematics*, **2021**.
DOI: 10.1137/21M1391493
6. **G. N. Alfarano**, J. Lieb, J. Rosenthal. Construction of LDPC convolutional codes via difference triangle sets. *Designs, Codes and Cryptography*, **2021**.
DOI: 10.1007/s10623-021-00912-5

5. **G. N. Alfarano**, K. Khathuria, V. Weger. A survey on single server private information retrieval in a coding theory perspective. *Applicable algebra in engineering communication and computing*, **2021**.
DOI: 10.1007/s00200-021-00508-5
4. **G. N. Alfarano**, F.J. Lobillo, and A. Neri. Roos bound for skew cyclic codes in Hamming and rank metric. *Finite Fields and Their Applications*, 69: 101772, **2021**.
DOI: 10.1016/j.ffa.2020.101772
3. **G. N. Alfarano** and J. Lieb. On the left primeness of some polynomial matrices with applications to convolutional codes. *Journal of Algebra and its applications*, **2020**.
DOI: 10.1142/S0219498821502078
2. **G. N. Alfarano**, M. Borello, and A. Neri. A geometric characterization of minimal codes and their asymptotic performance. *Advances in Mathematics of Communications*, **2020**.
DOI: 10.3934/amc.2020104
1. **G. N. Alfarano**, C. Beierle, T. Isobe, S. Kölbl, G. Leander. ShiftRows Alternatives for AES-like Ciphers and Optimal Cell Permutations for Midori and Skinny. *IACR Transactions of Symmetric Cryptology*. 2018(2): 20-47, **2018**.
DOI: 10.13154/tosc.v2018.i2.20-47

REFEREED CONFERENCE PROCEEDINGS

2. **G. N. Alfarano**, A. Ravagnani, E. Soljanin. Dual-Code Bounds on Multiple Concurrent (Local) Data Recovery. *2022 IEEE International Symposium on Information Theory (ISIT)*, **2022**.
DOI: 10.1109/ISIT50566.2022.9834616.
1. **G. N. Alfarano**, J. Lieb, and J. Rosenthal. Construction of Rate $(n - 1)/n$ Non-Binary LDPC Convolutional Codes via Difference Triangle Sets. *2020 IEEE International Symposium on Information Theory (ISIT)*, **2020**.
DOI: 10.1109/ISIT44484.2020.9174510.

PREPRINTS

6. **G. N. Alfarano**, E. Byrne. The Critical Theorem for q -Polymatroids. *submitted*, **2023**.
arXiv version, <https://arxiv.org/abs/2305.07567>
5. **G. N. Alfarano**, A. Neri, F.Zullo. Maximum Flag-Rank Distance Codes. *submitted*, **2023**.
arXiv version, <https://arxiv.org/abs/2303.16653>
4. **G. N. Alfarano**, A. B. Kılıç, A. Ravagnani, E. Soljanin. The Service Rate Region Polytope. *submitted*, **2023**.
arXiv version, <https://arxiv.org/abs/2303.04021>
3. **G. N. Alfarano**, M. Borello, A. Neri. Outer Strong Blocking Sets. *submitted*, **2023**.
arXiv version, <https://arxiv.org/abs/2301.09590>
2. **G. N. Alfarano**, E. Byrne. The Cyclic Flats of a q -Matroid. *submitted*, **2022**.
arXiv version, <https://arxiv.org/abs/2204.02353>
1. **G. N. Alfarano**, K. Khathuria, and S. Tinani. On Cyclic Matroids and their Applications. *submitted*, **2021**.
arXiv version, <https://arxiv.org/abs/2107.14214>

INVITED TALKS

16. **Minimal Codes and Strong Blocking Sets** July 2023
 SIAM Conference on Applied Algebraic Geometry (AG23).
 Special Session: Coding Theory and Galois Geometries.
 Eindhoven, The Netherlands.
15. **Maximum Flag Rank Distance Codes** July 2023
 29th Nordic Congress of Mathematicians with EMS.
 Special Session: Algebraic Coding Theory and Cryptography.
 Aalborg, Denmark.
14. **Rank-Metric Codes and q -Matroids** April 2023
 University of Groningen, The Netherlands.
13. **Matroidal Approach to Coding Theory** December 2022
 University of Zurich, Switzerland.
12. **Critical Problem for q -Polymatroids** December 2022
 University of Paris VIII, France.
11. **Critical Problem, q -Polymatroids and Rank-Metric Codes** August 2022
 ACA 2022, Session “Algebraic and Geometric Methods in Coding Theory”, Istanbul, Turkey.
10. **q -Analogues of matroids and codes** Apr 2022
 Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
9. **(Linear) cutting blocking sets and minimality of codes** October 2021
 Sabancı Algebra Seminar, Turkey
8. **(Linear) cutting blocking sets and their codes** September 2021
 PICS, Postgraduate International Coding theory Seminar.
7. **Bounds on the distance of skew cyclic codes** September 2021
 Seminar Discrete Mathematics, Codes and Cryptography - University of Paris 8.
6. **A geometric interpretation of minimal code** May 2021
 De Cifris, Schola Latina Seminars.
5. **Geometric aspects of minimal linear code** March 2021
 Maths Postgraduate Seminar Series, University College Dublin.
4. **The geometry of minimal linear codes** March 2021
 eSeminar UGent-VUB.
3. **What is...a convolutional code?** December 2019
 Zurich Graduate Colloquium, Zurich, Switzerland.
2. **σ -Quasicyclic and Projective Convolutional Codes** June 2019
 University of Alicante, Alicante, Spain.
1. **An introduction to Convolutional Codes** June 2018
 Research Seminars, University of Trento, Trento, Italy.

OTHER TALKS

10. **Minimal Codes and Strong Blocking Sets** July 2023
 International Conference on Finite Fields and Their Applications 2023 (Fq15).
 Paris, France.

9. **Weighted Reed-Solomon Convolutional Codes** June 2023
Workshop on Convolutional Codes.
Zurich, Switzerland.
8. **Cyclic Spaces, q -Matroids and Rank-Metric Codes** January 2023
Dutch-Belgian discrete math seminar
Ghent University, Ghent (Belgium).
7. **q -Matroids and rank-metric codes** August 2022
ACA 2022, Session “ q -analogues in combinatorics: matroids, designs and codes”, Istanbul, Turkey.
6. **The geometry of minimal codes** July 2022
“Contemporary Algebraic and Geometric Techniques in Coding Theory and Cryptography”,
(virtual summer school) Università degli Studi della Campania, Luigi Vanvitelli.
5. **Dual-Code Bounds on Multiple Concurrent (Local) Data Recovery** June 2022
IEEE International Symposium on Information Theory (ISIT), Aalto University, Espoo, Finland.
4. **q -Matroids and rank-metric codes** June 2022
Combinatorics 2022, Mantua, Italy.
3. **Roos-like bound for skew-cyclic codes in Hamming and (sum-)rank metric** September 2021
First Annual Conference: Cryptography and Coding Theory.
2. **Construction of Rate $(n-1)/n$ Non-Binary LDPC Convolutional Codes via Difference Triangle Sets** June 2020
IEEE International Symposium on Information Theory (ISIT), Los Angeles, California, (virtual conference).
1. **New Algebraic Construction of MDP Convolutional Codes** December 2019
Arbeitsgemeinschaft in Codierungstheorie und Kryptographie, University of Neuchatel, Switzerland.

OTHER ACTIVITIES

- “**Matematica per la crittografia**” May-June 2021
Laboratory of Cryptography for High School Students, 6 hours, in italian.
Liceo Scientifico, Leonardo da Vinci, Noci, Italy.

WORKSHOPS AND CONFERENCES ATTENDED

- SIAM Conference on Applied Algebraic Geometry (AG23)** July 2023
Eindhoven, The Netherlands.
- 29th Nordic Congress of Mathematicians with EMS** July 2023
Aalborg, Denmark.
- International Conference on Finite Fields and Their Applications 2023 (Fq15)** June 2023
Paris, France.
- Workshop on Convolutional Codes** June 2023
Zurich, Switzerland.
- Alcocrypt: Algebraic and Combinatorial Methods for Coding and Cryptograph** February 2023

CIRM, Luminy, Marseille, France.

25th International Symposium on Mathematical Theory of Networks and Systems (MTNS 2022)

September 2022

Bayreuth, Germany.

Finite Geometries 2022, Sixth Irsee Conference

August-September 2022

Conference

Irsee Monastery, Germany.

ACA 2022, Applications of Computer Algebra

August 2022

Conference

Istanbul, Turkey.

Summer School: “Contemporary Algebraic and Geometric Techniques in Coding Theory and Cryptography”

July 2022

virtual summer school

University of Campania, Luigi Vanvitelli.

Coding theory and cryptography:

A conference in honor of Joachim Rosenthal’s 60th birthday

July 2022

Conference

Zurich, Switzerland

Summer School: “ACT 22: Algebraic Coding Theory (ACT)”

July 2022

Zurich, Switzerland

IEEE International Symposium on Information Theory (ISIT) 2022

June 2022

Aalto University, Espoo, Finland.

Combinatorics 2022

May-June 2022

Conference

Mantua, Italy

Summer School: “ACT 20: Algebraic Coding Theory (ACT)”

June 2021

virtual summer school

Zurich, Switzerland

International Workshop on the Arithmetic of Finite Fields (WAIFI) 2020

July 2020

virtual conference

Rennes, France.

IEEE International Symposium on Information Theory (ISIT) 2020

June 2020

virtual conference

Los Angeles, California, USA

Munich Workshop on Coding and Cryptography 2019

July 2019

Technische Universität München, Germany

SIAM Conference on Applied Algebraic Geometry

July 2019

Bern, Switzerland

Summer School: “Finite Geometry & Friends”

June 2019

Vrije Universiteit Brussel, Belgium

Oberwolfach Workshop 1912

March 2019

Contemporary Coding Theory

Germany

Dagstuhl Seminar 18511

December 2018

Algebraic Coding Theory for Networks, Storage, and Security

Germany

CIMPA Research School and Workshop

August–September 2018

Quasi-Cyclic and Related Algebraic Codes

Ankara, Turkey

**Summer School: Number theory and coding theory,
contemporary applications in security**

May–June 2018

Turku, Finland

Munich Workshop on Coding and Cryptography 2018

April 2018

Technische Universität München, Germany

TEACHING EXPERIENCE

Lecturer and Organizer

February 2022–June 2022

MAT011 Matroids theory

University of Zurich, Switzerland

Teaching Assistant

April 2018–current

University of Zurich, Switzerland

Duties: frontal lectures, exercise classes,
preparation and correction of exams and homeworks.

MAT476 Finite Fields, Theory and Applications (Fall 2020)

MAT512 Elliptic curves (Spring 2018, Spring 2020)

MAT001 Kryptographie (Fall 2019)

MAT005 Codierungstheorie (Spring 2019)

MAT211 Algebra (Fall 2018)

Tutor and Teaching Assistant

March 2015–December 2017

University of Trento, Italy

Duties: frontal lectures, exercise classes.

Analisi Matematica I

MENTORING EXPERIENCE

Master student co-supervised: B. Toesca di Castellazzo

May 2022 - current

University of Zurich, Switzerland

jointly with Prof. Dr. J. Rosenthal

Thesis title: “Maximal Partial Spreads in Schubert Varieties”

Master student co-supervised: S. La Rosa

October 2021 - current

University of Zurich, Switzerland
jointly with Prof. Dr. J. Rosenthal
Thesis title: “Minimal Codes and Secret Sharing Schemes”

Master student co-supervised: N. Zürcher

September 2019 - August 2020

University of Zurich, Switzerland
jointly with Prof. Dr. J. Rosenthal
Thesis title: “On the Intractability of Maximum-Likelihood Decoding
for Reed–Solomon Self-Dual Codes”

Master student co-supervised: A. Gruica

August 2019 - April 2020

University of Zurich, Switzerland
jointly with Prof. Dr. J. Rosenthal
Thesis title: “MDP Convolutional Codes over $\mathbb{Z}/p^r\mathbb{Z}$ ”

ORGANIZATIONAL AND PROFESSIONAL EXPERIENCE

Co-organizer of “Workshop on Convolutional Codes”

June 5 – 9, 2023

University of Zurich, Switzerland.

Link: <https://www.math.uzh.ch/convolutionalcodes>

Co-organizer of the Session “Network Coding” for the conference “25th International Symposium
on Mathematical Theory of Networks and Systems (MTNS 2022)”

September 12-16, 2022

Bayreuth, Germany.

Link: <https://www.mtns2022.uni-bayreuth.de/en/index.html>

Co-organizer of the Session “ q -analogues in combinatorics” for the conference “ACA 2022 - Ap-
plications of Computer Algebra”

August 15 – 19, 2022

Istanbul-Gebze, Turkey

Link: <https://sites.google.com/view/michela-ceria-home-page/aca-2022-q-mat>

Co-organizer of the events “Female in math get-togethers”

October 2021–current

University of Zurich and ETH Zurich

Co-organizer of the seminars “Zurich Graduate Colloquium”

February 2021–current

Zurich Graduate School in Mathematics

Co-organizer of “ACT 21: Algebraic Coding Theory e-Summer School”

June 7 – 11, 2021

University of Zurich, Switzerland

Link: <https://www.math.uzh.ch/act/>

Co-organizer of “ACT 22: Algebraic Coding Theory Summer School”

July 4 – 8, 2022

University of Zurich, Switzerland

Link: <https://www.math.uzh.ch/act/>

Co-organizer of “Coding Theory and Cryptography,

A conference in honor of

Joachim Rosenthal’s 60th birthday”

July 11 – 15, 2022

University of Zurich, Switzerland

Link: <https://www.math.uzh.ch/aa/index.php?id=32>

REVIEWING ACTIVITY

Reviewer for the following scientific journals

“Discrete Mathematics”

“Designs, Codes and Cryptography”

“IEEE, Transactions on Information Theory”

“Advances in Mathematics of Communications”

“Cryptography and Communications”

“Finite Fields and Their Applications”

“Journal of Algebra and its Applications”

Reviewer for Conference Proceedings

IEEE ISIT

IEEE ISTC

REFERENCES

- Prof. Joachim Rosenthal, University of Zurich, rosenthal@math.uzh.ch
- Prof. Eimear Byrne, University College Dublin, ebyrne@ucd.ie