

Diego González Sánchez

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<https://dglez91.github.io/>

Employment

11/2020 – | **Research fellow**, Alfréd Rényi Institute of Mathematics, Hungary

Education

10/2016 – 10/2020 | **Ph.D.**, Autonomous University of Madrid, Spain
Thesis: *Topics in additive combinatorics and higher order Fourier analysis*
Supervisor: Prof. Pablo Candela. Defended on 25/09/2020.
Final score: Outstanding (*sobresaliente*) cum laude.

09/2015 – 07/2016 | **M.A.St.**, in Pure Mathematics (Part III), Cambridge University, UK
Final score: 73/100, Merit

09/2009 – 06/2015 | **B.Sc.** in Mathematics, Autonomous University of Madrid, Spain.
Final score: 9.41/10 outstanding (*sobresaliente*)
B.Sc. in Computer Science, Autonomous University of Madrid, Spain.
Final score: 9.41/10 outstanding (*sobresaliente*)

Visiting periods (at least one month)

05/2019 – 08/2019 | Visiting researcher, Alfred Renyi Institute of Mathematics, Hungary
09/2013 – 07/2014 | Erasmus student, Technical University of Denmark, Denmark

Papers published or accepted for publication

- [1] | *On \mathbb{F}_2^ω -affine-exchangeable probability measures*, (with P. Candela and B. Szegedy). Open access: [arXiv:2203.08915](#). Accepted for publication at *Studia Mathematica*.
- [2] | *On measure-preserving \mathbb{F}_p^ω systems of order k* , (with P. Candela and B. Szegedy). Accepted for publication at *Journal d'Analyse Mathématique*. Open access: [arXiv:2311.13899](#).
- [3] | *On higher-order Fourier analysis in characteristic p* , (with P. Candela and B. Szegedy). *Ergodic Theory and Dynamical Systems*, 1-70, (2022). Open access: [arXiv:2109.15281](#).
- [4] | *A refinement of Cauchy-Schwarz complexity*, (with P. Candela and B. Szegedy). *European Journal of Combinatorics* 106, 103592 (2022). Open access: [arXiv:2109.05965](#).
- [5] | *A Refinement of Cauchy-Schwarz Complexity, with Applications*, (with P. Candela and B. Szegedy). *Extended Abstracts EuroComb 2021*, 293-298 (2021). Open access: [arXiv:2109.05965](#).
- [6] | *Optimal transport with f -divergence regularization and generalized Sinkhorn algorithm*, (with D. Terjék). *International Conference on Artificial Intelligence and Statistics*, 5135-5165 (2022). Open access: [arXiv:2105.14337](#).
- [7] | *New estimates for exponential sums over multiplicative subgroups and intervals in prime fields*, (with D. Di Benedetto, M. Z. Garaev, V. C. Garcia, I. E. Shparlinski, and C. A. Trujillo). *Journal of Number Theory* 215, 261-274 (2020). Open access: [arXiv:2003.06165](#).

- [8] *On sets with small sumset and m -sum-free sets in $\mathbb{Z}/p\mathbb{Z}$* , (with P. Candela and D. J. Grynkiewicz. Bulletin de la Société Mathématique de France 149 (1), 155-177 (2020). Open access: [arXiv:1909.07967](#).
- [9] *A step towards the $3k - 4$ conjecture in $\mathbb{Z}/p\mathbb{Z}$ and an application to m -sum-free sets*, (with P. Candela and D. J. Grynkiewicz). Acta Mathematica Universitatis Comenianae, Volume 88, (2019), Issue 3, pp. 521-525 (2019). Open access: [arXiv:1909.07967](#).
- [10] *A note on the Bilinear Bogolyubov Theorem: Transverse and bilinear sets*. With P.-Y. Bienvenu and A. D. Martínez. Proceedings of the American Mathematical Society 148 (1), 23-31 (2020). Open access: [arXiv:1811.09853](#).
- [11] *On nilspace systems and their morphisms.*, (with P. Candela and B. Szegedy). Ergodic Theory and Dynamical Systems, 1-15 (2019). Open access: [arXiv:1807.11510](#).
- [12] *A Plünnecke-Ruzsa inequality in compact abelian groups.*, (with P. Candela and A. de Roton). Revista Matemática Iberoamericana 35 (7), 2169-2186 (2019). Open access: [arXiv:1712.07615](#).

Preprints

- [13] *On the inverse theorem for Gowers norms in abelian groups of bounded torsion*, (with P. Candela and B. Szegedy). Open access: [arXiv:2311.13899](#).
- [14] *Free nilspaces, double-coset nilspaces, and Gowers norms*, (with P. Candela and B. Szegedy). Open access: [arXiv:2305.11233](#).
- [15] *A framework for overparameterized learning*, (with D. Terjék). Open access: [arXiv:2205.13507](#).

Contributed talks at conferences and workshops

- 07/2024 *A short proof of an inverse theorem in bounded torsion groups* at Discrete Mathematics Days 2024, Alcalá de Henares, Spain.
- 11/2023 *On measure-preserving \mathbb{F}_p^ω systems of order k* at the 11th workshop Operator Theoretic Aspects of Ergodic Theory, Wuppertal, Germany.
- 06/2023 *Free nilspaces, double-coset nilspaces, and Gowers norms* at Nilpotent structures in topological dynamics, ergodic theory and combinatorics, Będlewo Conference Center, Poland.
- 05/2022 *On affine-exchangeable measures and nilspaces* at the workshop Graphs, Groups, Stochastic Processes, Alfréd Rényi Institute of Mathematics, Budapest, Hungary.
- 09/2021 *A Refinement of Cauchy-Schwarz Complexity, with Applications*, at EuroComb 2021, online (Barcelona, Spain).
- 08/2019 *The $3k - 4$ theorem in $\mathbb{Z}/p\mathbb{Z}$ and an application to m -sum-free sets* at EuroComb 2019, Univerzita Komenského, Bratislava, Slovakia.
- 12/2017 *La desigualdad de Plünnecke-Ruzsa en grupos abelianos compactos* at the LXVI Reunión de Comunicaciones Científicas of RSME and UMA, Buenos Aires, Argentina.

Invited talks at seminars

- 06/2024 *On measure-preserving \mathbb{F}_p^ω -systems of order k* . at DAGGER seminar, University of Warwick, UK.
- 09/2022 *The Polyak-Łojasiewicz condition and overparameterized learning* (with D. Terjék) at Euler Seminar, Université catholique de Louvain, Louvain, Belgium.
- 03/2019 *Conjuntos grandes que se parecen a progresiones en grupos cíclicos de orden primo* (Large sets that resemble arithmetic progressions in cyclic groups of prime order), at Junior Seminar, Autonomous University of Madrid, Spain.

06/2018	<i>A Plünnecke-Ruzsa inequality in compact abelian groups</i> at UAM-ICMAT number theory seminar, ICMAT, Madrid, Spain.
03/2017	<i>El método polinomial en combinatoria aditiva</i> (the polynomial method in additive combinatorics) at the Junior Seminar, Autonomous University of Madrid, Spain.

Other events attended

07/2023	200 Years of Trinity Combinatorics, Cambridge, UK.
08/2019	Number theory in the Americas. Casa Matemática Oaxaca, Oaxaca, Mexico.
09/2018	Arithmetic Ramsey Theory, University of Manchester, Manchester, UK.
09/2017	The music of Numbers. Conference in honor of Javier Cilleruelo. ICMAT, Madrid, Spain.
05/2017	Graduate course on Interactions of harmonic analysis, combinatorics and number theory. BGSMATH, Barcelona, Spain.

Events organized

06/2025	(Expected) New Trends in Arithmetic Combinatorics and related Fields, a BIRS-IMAG workshop. Coorganized with: P. Candela (lead organizer), A. de Roton, H. Helfgott, A. Sedunova, and O. Serra. Important note: I do not appear yet on the BIRS webpage but my participation can be confirmed by contacting directly with any of the other organizers.
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Projects in which I have participated and role

03/2022 – 12/2025	<i>Artificial Intelligence National Laboratory (MILAB, RRF-2.3.1-21-2022-00004)</i> , NKFIH, Hungary. It partially funds the Research Fellow position at Alfréd Rényi institute of Mathematics. I work in the mathematical foundations of AI.
09/2021 – 08/2024	<i>Harmonic analysis, combinatorics and arithmetic</i> (PID2020-113350GB-I00) funded by MICINN, Spain. I am part of the working team.
11/2020 – 11/2022	<i>Momentum (Lendület) 30003</i> , NKFIH, Hungary. It partially funds the Research Fellow position at Alfréd Rényi institute of Mathematics. I work in HOF and in the mathematical foundations of AI.
11/2020 – 03/2025	<i>“Élvonal” KKP 133921 grant</i> , NKFIH, Hungary. It partially funds the Research Fellow position at Alfréd Rényi institute of Mathematics. I work in HOF and deep learning in this project.
01/2018 – 12/2020	<i>Arithmetic and harmonic analysis</i> , (MTM2017-83496-P) MINECO, Spain. I am part of the working team.

Research Fellowships/Prizes/Grants

15/07/2021	Extraordinary award to the best theses presented at the Autonomous University of Madrid in the period 01/10/2019 to 30/09/2020.
10/02/2017	La Caixa Severo Ochoa scholarship awarded by Fundación la Caixa (private company). Ph.D.’s funding. It included a monthly stipend, an amount for travels and other expenses, and all labour/tax costs.
27/06/2015	X Mutua Madrileña Postgraduate Scholarship awarded by Fundación Mutua Madrileña (private company). M.A.St.’s funding.
18/06/2014	JAE-intro scholarship for introduction to research awarded by CSIC, Ministry of Economy and Competitiveness, Spain.

03/12/2012	Madrid Excellence Scholarship awarded by the Autonomous Community of Madrid, Spain.
14/09/2011	Madrid Excellence Scholarship awarded by the Autonomous Community of Madrid, Spain.
26/01/2010	Madrid Excellence Scholarship awarded by the Autonomous Community of Madrid, Spain.

Accreditations

12/01/2022	<i>Profesor ayudante doctor</i> (assistant professor) granted by the Ministry of Universities of Spain.
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Graduate teaching

08/2021	Instructor at AGRA IV (Arithmetic, Groups and Analysis), online (Trieste, Italy).
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Undergraduate teaching

02/2024 – 05/2024	Professor (jointly with P.Zsámboi) of <i>Introduction to Deep Learning</i> at the Budapest Semesters in Mathematics (BSM), Spring Semester 2024 (28 hours taught).
09/2019 – 11/2019	Assistant professor of <i>Mathematics I</i> for the B.Sc. in Chemical engineering at the Autonomous University of Madrid (6 hours taught).
09/2018 – 01/2019	Assistant professor of <i>Mathematics</i> for the B.Sc. in Environmental Sciences at the Autonomous University of Madrid (15 hours taught).
09/2017 – 01/2018	Assistant professor of <i>Algebra I</i> for the B.Sc. in Physics at the Autonomous University of Madrid (15 hours taught).

Service

Referee for	<i>Analysis and PDE</i> , <i>AISTATS 2022</i> , <i>AISTATS 2024</i> and <i>The Ramanujan Journal</i> .
Reviewer for	<i>Zentralblatt MATH (zbMath)</i> .

Other outreach activities

22/04/2024	<i>Recent trends III: Subsets of the integers without three term arithmetic progressions</i> , an outreach article for the Discrete and Algorithmic Mathematics (DAM) network. Available at: https://dam-network.github.io/ .
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Languages

Human:	Spanish (mother tongue) English (fluent, used in professional contexts) French (basic).
Programming:	Python (including Pytorch), C, Java, SQL, Matlab, and R.