# Igor Balla

Curriculum Vitae

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# Research Interests

I am broadly interested in combinatorics and its connections to linear algebra. My current focus is on certain extremal problems lying at the intersection of these areas. Apart from being beautiful and interesting in their own right, these problems have connections to probability, geometry, applied mathematics, theoretical computer science, and quantum physics.

## Employment & Education

- 2024 **Postdoctoral Researcher**, Masaryk University
- 2021 2023 Postdoctoral Researcher, Hebrew University of Jerusalem
- 2019 2021 Postdoctoral Researcher, Tel Aviv University
- 2015 2019 **Doctor of Science in Mathematics**, *ETH Zürich* Advisor: Benny Sudakov
- 2012 2014 Master of Science in Mathematics, Courant Institute, New York University
- 2008 2012 **Bachelor of Science in Mathematics**, *Carnegie Mellon University* Minor in Computer Science

### **Teaching Experience**

2024	Lecturer	
	<ul> <li>Advanced Combinatorics, Masaryk University</li> </ul>	Spring 2024
2016 - 2019	Teaching Assistant	
	○ Graph Theory, ETH Zürich	Spring 2019
	<ul> <li>Algebra I, ETH Zürich</li> </ul>	Fall 2018
	<ul> <li>Graph Theory, ETH Zürich</li> </ul>	Spring 2017
	<ul> <li>Seminar on Elementary Number Theory, ETH Zürich</li> </ul>	Spring 2016
2012 - 2015	Tutor, Educational Tutoring and Consulting Center, Staten Island, NY	
	Conducted private and group lessons at the middle school to college level, as well a	s preparation
	for standardized tests.	
2010 - 2012	Teaching Assistant	
	<ul> <li>Matrix Theory, Carnegie Mellon University</li> </ul>	Spring 2012
	<ul> <li>Graph Theory, Carnegie Mellon University</li> </ul>	Spring 2010

# Awards and Scholarships

- 2019 2021 Swiss National Science Foundation Early Postdoc. Mobility Fellowship
- 2012 2014 Henry M. MacCracken Graduate Fellowship, New York University
  - 2012 Mellon College of Science Research Honors, Carnegie Mellon University
  - 2008 Award for Mathematical Research, Stuyvesant High School

### Publications

#### Submitted \_

- Orthonormal representations, vector chromatic number, and extension complexity. Balla, I. (2023). arXiv:2310.17482. Submitted.
- Equiangular lines via matrix projection. Balla, I. (2021). arXiv:2110.15842. Submitted.
   Accepted
- Small codes. Balla, I. (2023). Bulletin of the London Mathematical Society, to appear.
- On MaxCut and the Lovász theta function. Balla, I., Janzer, O., & Sudakov, B. (2023). Proceedings of the American Mathematical Society, to appear.

#### Published

- Orthonormal Representations of H-Free Graphs. Balla, I., Letzter, S. & Sudakov, B. (2020).
   Discrete & Computational Geometry, 64 (3), 654–670.
- The Minrank of Random Graphs over Arbitrary Fields. Alon, N., Balla, I., Gishboliner, L., Mond, A., & Mousset, F. (2020). Israel Journal of Mathematics, 235 (1), 63–77.
- Equiangular subspaces in Euclidean spaces. Balla, I., & Sudakov, B. (2018). Discrete & Computational Geometry, 61 (1), 81–90.
- Ramsey goodness of bounded degree trees. Balla, I., Pokrovskiy, A., & Sudakov, B. (2018).
   Combinatorics, Probability and Computing, 27 (3), 289–309.
- Equiangular Lines and Spherical Codes in Euclidean Space. Balla, I., Dräxler, F., Keevash, P., & Sudakov, B. (2018). Inventiones Mathematicae, 211 (1), 179–212.
- A remark on Hamilton cycles with few colors. Balla, I., Pokrovskiy, A., & Sudakov, B. (2017).
   Moscow J. Combinatorics and Number Theory, 7 (3), 259–263.
- Union-closed families of sets. Balla, I., Bollobás, B., & Eccles, T. (2013). Journal of Combinatorial Theory Series A, 120 (3), 531–544.

#### Preprints

- Note on the second eigenvalue of regular graphs. Balla, I., Räty, E., Sudakov, B., & Tomon, I. (2023). arXiv:2311.07629.
- Minimum density of union-closed families. Balla, I. (2011). arXiv:1106.0369.

# Services

#### Journal Referee

- Forum of Mathematics, Sigma
- Experimental Mathematics
- Combinatorica
- The Journal of Combinatorial Theory, Series A
- ACM Transactions on Computation Theory
- Combinatorics, Probability and Computing
- The European Journal of Combinatorics
- The Electronic Journal of Combinatorics
- Discrete Mathematics
- Moscow Journal of Combinatorics and Number Theory

#### **Conference Review**

Symposium on Computational Geometry (SoCG)

# Workshops and Programs

0	FUB-TAU Workshop on Ramsey Theory, Tel Aviv	March 2020
0	FUB-TAU Workshop on Graph and Hypergraph Coloring Problems, Berlin	August 2018
0	Oberwolfach Workshop: Combinatorics	January 2017
0	Graph Limits, Groups, and Stochastic Processes, Rényi Institute, Budapest	Summer 2014
0	cSplash, Courant Institute, NYU	April 2014
0	DIMACS REU, Rutgers University	Summer 2010

# Talks

<ul> <li>Seminar on Foundations of Computing, Masaryk University</li> </ul>	2024
<ul> <li>Discrete Mathematics Seminar, Princeton University</li> </ul>	2023
<ul> <li>Richard P. Stanley Seminar in Combinatorics, MIT/Harvard</li> </ul>	2023
<ul> <li>Combinatorics Seminar, Technion</li> </ul>	2023
<ul> <li>Combinatorics Seminar, Bar Ilan University</li> </ul>	2023
<ul> <li>Combinatorics Seminar, Hebrew University of Jerusalem</li> </ul>	2023
$_{\odot}$ KU-Jerusalem Lunch Seminar, Hebrew University of Jerusalem	2022
<ul> <li>Random Structures and Algorithms, Gniezno</li> </ul>	2022
<ul> <li>Codes and Expansions (CodEx) Seminar</li> </ul>	2022
O Combinatorics, Physics and Probability Seminar, CMSA, Harvard University	2022
<ul> <li>Combinatorics Seminar, Hebrew University of Jerusalem</li> </ul>	2021
<ul> <li>Research Seminar in Combinatorics, Tel Aviv University</li> </ul>	2021
<ul> <li>Combinatorics Research Seminar, The Free University of Berlin</li> </ul>	2021
<ul> <li>Research Seminar in Combinatorics, Tel Aviv University</li> </ul>	2019
<ul> <li>Discrete Mathematics Seminar, Princeton University</li> </ul>	2019
<ul> <li>Random Structures and Algorithms, ETH Zürich</li> </ul>	2019
<ul> <li>Mittagsseminar, ETH Zürich</li> </ul>	2019
<ul> <li>Mittagsseminar, ETH Zürich</li> </ul>	2017
<ul> <li>Eurocomb, Vienna</li> </ul>	2017
<ul> <li>Random Structures and Algorithms, Gniezno</li> </ul>	2017
<ul> <li>Oberwolfach Workshop: Combinatorics</li> </ul>	2017
<ul> <li>SIAM Conference on Discrete Mathematics, Georgia State University</li> </ul>	2016
<ul> <li>Mittagsseminar, ETH Zürich</li> </ul>	2016
<ul> <li>CS Student Seminar, Courant Institute, NYU</li> </ul>	2014
<ul> <li>Discrete Mathematics Seminar, Rutgers University</li> </ul>	2012
$_{\odot}$ Algorithms, Combinatorics, and Optimization Seminar, CMU	2012