

# Igor Balla

## Curriculum Vitae

Einstein Institute of Mathematics  
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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

- 2022 – 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

- 2016 – 2019 **Teaching Assistant**
- Graph Theory, ETH Zürich Spring 2019
  - Algebra I, ETH Zürich Fall 2018
  - Graph Theory, ETH Zürich Spring 2017
  - Seminar on Elementary Number Theory, ETH Zürich 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 as preparation for standardized tests.
- 2010 – 2012 **Teaching Assistant**
- Matrix Theory, Carnegie Mellon University Spring 2012
  - Graph Theory, Carnegie Mellon University 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., Rätty, 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
- 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

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

## Talks

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