

CURRICULUM VITAE

• **Personal Details**

Name: Izhar Oppenheim

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• **Education**

B.A. - 1999-2002, Technion, Department of Mathematics

M.A. - 2004-2008, Tel-Aviv University, Department of Mathematics

Name of advisor: Prof. Eli Glasner

Title of thesis: The Rohlin property for the pseudo-arc

Ph.D. - 2008-2012, Technion, Department of Mathematics

Name of advisor: Prof. Uri Bader

Title of thesis: Groups acting on simplicial complexes

• **Employment History**

2019-now: Senior Lecturer (tenured), Ben-Gurion University

2018-2019: Senior Lecturer (tenure-track), Ben-Gurion University

2015-2018: Lecturer (tenure-track), Ben-Gurion University

2012-2015: Zassenhaus Assistant Professor (Post-Doc position), Ohio State University

• **Professional Activities**

(a) Positions in academic administration:

November 2017-now - Mathematics department Graduate students adviser

(b) Ad-hoc reviewer for journals:

Journal of the European Mathematical Society, Annales de l'Institut Fourier, Journal of Combinatorial Theory A

• **Educational activities**

Courses taught:

Advanced math courses for math majors/math graduate students taught at Ben-Gurion University:

- Introduction to topology.
- Basic concepts in modern analysis.

- Fourier analysis.
- Fundamentals of measure theory.
- Reading course: Kazhdan property (T).
- Reading course: coarse geometry.

Service courses at the undergraduate level taught at Ben-Gurion University:

- First course in calculus (Hedva 1) for electrical engineers - 2 times.
- Second course in calculus (Hedva 2) for mechanical engineers.
- Integral calculus and ordinary differential equations for electrical engineers.
- Multivariable calculus for electrical engineers.
- Fourier analysis for electrical engineers.

Courses at the undergraduate level taught at Ohio State University:

- First course in calculus at OSU (Math 1151) - 2 times.
- Accelerated Calculus I for Honors Engineers at OSU (Math 1161.02) - 2 times.
- Second course in calculus at OSU (Math 1172) - 3 times.
- Introduction to analysis (Math 4547) - 2 times.
- Pre-calculus course (Math 1150).

Research students:

- Zohar Reizis, M.Sc., current

- **Awards**

Elisha Netanyahu prize, Technion. Highest prize of the Technion's math department for excellence in Ph.D. research (awarded once a year to only one Ph.D. graduate), 2012

Haim Hanani prize, Technion, 2010

M.A. Award. Tel-Aviv Faculty excellence award for M.A. research, 2008

- **Scientific Publications**

(a) Conference publications

1. T. Kaufman, I. Oppenheim. Construction of new local spectral high dimensional expanders. STOC 2018 : ACM Symposium on Theory of Computing.
2. T. Kaufman, I. Oppenheim. High Order Random Walk - Beyond Spectral Gap. International Workshop on Randomization and Computation.

(b) Journal publications

1. I. Oppenheim. 2014. An intermediate quasi-isometric invariant between subexponential asymptotic dimension growth and Yu's Property A. *Internat. J. Algebra and Comput.*, (2014) 24 (6) : 909-922.
2. I. Oppenheim. 2014. Property A and the existence of a Markov process with a trivial Poisson boundary. *Bull. London Math. Soc.* (2014) 46 (4): 836-846.
3. I. Oppenheim. 2014. Fixed point theorem for reflexive Banach spaces and uniformly convex non positively curved metric spaces. *Mathematische Zeitschrift* 278 (2014), no. 3-4: 649-661.
4. I. Oppenheim. 2015. Vanishing of cohomology and property (T) for groups acting on weighted simplicial complexes. *Groups Geom. Dyn.* 9 (2015), no. 1: 67-101.
5. I. Oppenheim. 2015. Property (T) for groups acting on simplicial complexes through taking an "average" of Laplacian eigenvalues. *Groups Geom. Dyn.* 9 (2015), no. 4: 1131-1152.
6. I. Oppenheim. 2017. Averaged projections, angles between groups and strengthening of property (T). *Mathematische Annalen*, (2017) 367 (1-2) : 623-666.
7. I. Oppenheim. 2017. Vanishing of cohomology with coefficients in representations on Banach spaces of groups acting on Buildings. *Commentarii Mathematici Helvetici*, (2017) 92 (2) : 389-428.
8. I. Oppenheim. Angle criteria for uniform convergence of averaged projections and cyclic or random products of projections. *Israel Journal of Mathematics*, 223 (2018), no. 1, 343-362.
9. I. Oppenheim. Local spectral expansion approach to high dimensional expanders I: descent of spectral gaps. *Discrete and Computational Geometry*, 59 (2018), no. 2, 293-330.

• **Short term visits**

- Institute of Mathematics of the Polish Academy of Sciences, Warsaw, Poland, April 2016.
- Hausdorff institute Bonn, Germany, special trimester devoted to the subject of Rigidity, September 2009.

• **Lectures and Presentations at Meetings and Invited Seminars**

(a) Invited plenary lectures at conferences/meetings

- 2017, Title: "Garland method's" (2 Talk's), School on Geometric, Topological and Computational Aspects of High-Dimensional Combinatorics (held at Sde-Boker).
- 2016, Title: "Cohomologies with coefficients in Banach representations for groups acting on buildings", Workshop on High-dimensional Expanders, Switzerland (organized by ETH).

- 2013, Title: “Fixed point property for groups acting on simplicial complexes”, Non positive curvature, isometric actions and dynamics of cocycles conference (held at Cajon del Maipo, Chile).
- (b) Presentation of papers at conferences/meetings (oral or poster)
- Tali Kaufman and Izhar Oppenheim, 2018, Construction of new local spectral high dimensional expanders, STOC 2018 : ACM Symposium on Theory of Computing.
- (c) Presentations at informal international seminars and workshops
- 2019, Title: “Random walks on simplicial complexes”, Beyond Randomized Rounding and the Probabilistic Method workshop, Simons institute, Berkeley.
  - 2018, Title: “Special Day on Random Groups and Property (T)” (4 Talk’s), Research Group on High Dimensional Combinatorics, Israel Institute for Advanced studies in the Hebrew University.
  - 2017-2018, Title: “Spectral high dimensional expanders: the Garland method” (3 Talk’s), Research Group on High Dimensional Combinatorics, Israel Institute for Advanced studies in the Hebrew University.
  - 2017, Title: “Construction of new high dimensional local spectral expanders”, Research Group on High Dimensional Combinatorics, Israel Institute for Advanced studies in the Hebrew University.
  - 2015, Title: “Between subexponential asymptotic dimension growth and Yu’s Property A”, Spring Topology and Dynamics Conference (held at BGSU).
  - 2014, Title: “Property (T) from a spectral gap of the 1-dimensional links”, Topological Methods in Group Theory conference (held at OSU).
  - 2012, Title: “Local criteria for Kazhdan property (T)”, Israel Mathematical Union annual meeting.
  - 2011, Title: “Criteria for Kazhdan property (T) - some variations on Zuk’s criterion”, Geometric group theory conference (held by Center for Mathematical Sciences at the Technion).
  - 2010, Title: “Triangle Buildings”, CAT(0) spaces and Affine Buildings workshop (held by the Israel Science Foundation).
- (d) Seminar presentations at universities and institutions
- 2018, Department of Computer-Science Theory seminar, Ben-Gurion University, Construction of High Dimensional Spectral Expanders.
  - 2018, Department of Computer-Science Theory seminar, Tel-Aviv University, Construction of High Dimensional Spectral Expanders.
  - 2018, Ben-Gurion Ashalim Program, Banach-Tarski Paradox - Popular Science Lecture.
  - 2017, Department of Mathematics and Department of Computer-Science joint seminar, Bar-Ilan University, Spectral descent in simplicial complexes.

- 2016, Action now wandering seminar, held at Tel-Aviv university, A strengthened version of Banach property (T) and angles between projections.
- 2015, Department of Mathematics, Technion-ILL, A criterion for quick convergence of averaged projections in Banach spaces.
- 2015, Department of Mathematics, Ben-Gurion University, Strengthening of Banach property (T) and applications.
- 2015, Department of Mathematics, Ohio State University, High dimensional expanders from a 1-dimensional perspective.
- 2014, Department of Mathematics, Technion-ILL, Coarse embedding in a Hilbert space.
- 2013, Department of Mathematics, Ohio State University, Property A and the existence of a Markov process with a trivial Poisson boundary.
- 2012, Department of Mathematics, Technion-ILL, Fixed point property for groups acting on simplicial complexes.
- 2011, Department of Mathematics, Université catholique de Louvain, Criteria for Kazhdan property (T) – variations on Zuk’s criterion. Université catholique de Louvain.
- 2011, Department of Mathematics, Université de Genève, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2011, Department of Mathematics, Brandeis University, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2011, Department of Mathematics, Brown University, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2011, Department of Mathematics, Rutgers University, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2011, Department of Mathematics, Yale University, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2011, Department of Mathematics, Indiana University, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2011, Department of Mathematics, University of Illinois at Chicago, Criteria for Kazhdan property (T) – variations on Zuk’s criterion.
- 2008, Department of Mathematics, Tel-Aviv University, The Rohlin property of Fraïssé limits with application to the pseudo-arc.

• **Present Academic Activities**

Research in progress

- High dimensional expanders and applications to computer science, ongoing research partly joint with Prof. Tali Kaufman.
- Banach Kazhdan property (T) and spectral gaps in the Banach spaces, ongoing research.
- Vanishing of cohomology with  $L^p$  coefficients for random groups, joint with Alex Lubotzky and Ron Rosenthal.

### Articles to be published

In preparation:

1. Construction of new local spectral high dimensional expanders, joint with Tali Kaufman (a version was already accepted to STOC 2018 : ACM Symposium on Theory of Computing - see above, but it will also be submitted to a mathematical journal).
2. New examples of cosystolic high dimensional expanders (working title), joint with Tali Kaufman.

Submitted:

1. High Order Random Walks: Beyond Spectral Gap, joint with Tali Kaufman, submitted to *Combinatorica*.
2. Local spectral expansion approach to high dimensional expanders II: Mixing and Geometrical overlapping. Submitted to *Discrete and Computational Geometry*.
3. Non  $p$ -norm approximated Groups, joint with Alexander Lubotzky, submitted to *Journal d'Analyse Mathématique*.

### • **Research Grants**

- ISF Individual Research Grant 293/18, Sole PI, Period of grant: 10/18-9/22, Annual amount: 245,000 NIS (67,250 \$), Total Amount: 980,000 NIS (269,000 \$)