Curriculum Vitae
David Jekel

1 Summary

I am a mathematician working on the interactions between *von Neumann algebras* and *random matrix theory*, through the lenses of entropy, optimal transport, stochastic control, and continuous model theory.

I obtained my Ph.D. in 2020 from UCLA with Dimitri Shlyakhtenko. In 2020-2023, I was an NSF postdoctoral fellow at UCSD with Todd Kemp. In 2023-2024, I was a postdoc at the Fields Institute for the thematic program on operator algebras, and then a postdoc at York University. Since June 2024 I have been a postdoc at University of Copenhagen with Magdalena Musat and Mikael Rørdam, and I obtained a Marie Curie fellowship that started in April 2025.

I am committed to excellence in teaching both in the classroom and in reading courses and mentorship of students and young researchers. I have put a lot of thought and time into teaching so that students can most effectively learn and be supported in their identity and their goals. Besides teaching courses, I have continued to meet with undergraduates and graduate students for reading courses and research collaboration. I have been involved in several networks to support early-career researchers, as well as co-supervised a master's thesis.

This CV is organized as follows: Education, Employment, Publications, Conferences, Teaching Experience, Outreach, and Honors.

2 Education

Ph. D. at University of California, Los Angeles

- **Degree:** Ph.D. in Mathematics.
- **Graduation date:** June 12, 2020.
- **Advisor:** Dimitri Shlyakhtenko.
- **Dissertation:** Evolution equations in non-commutative probability theory.
- **Dissertation committee:** Dimitri Shlyakhenko, Sorin Popa, Terence Tao, Mario Bonk.
- **GPA:** 4.00.

Undergraduate at University of Washington, Seattle

- **Degrees:** B.S. in Math and B. A. in (Greek and Roman) Classics, with Honors.
- **Graduation date:** June 12, 2015.
- **GPA:** 3.99.
- Research on resistor networks under James Morrow.
- Math honors thesis on free boundary problems under Tatiana Toro, exposition of Caffarelli's paper "Lipschitz free boundaries are $C^{1,\alpha}$."
- Classics senior essay under Catherine Connors.

3 Employment

NSF Postdoc, UC San Diego

- **Employer:** University of California, San Diego.
- **Date:** July 2020-June 2023.
- **Title:** NSF Postdoctoral Fellow in 2020-2023, Lecturer (instructor) in 2021-2023.
- **Supervisor:** Todd Kemp

Postdoc, Fields Institute

- **Employer:** Fields Institute for Research in Mathematical Sciences (University of Toronto).
- **Date:** July 2023-March 2024.
- **Title:** Postdoc associated to the long program in Operator Algebras.
- **Supervisor:** Ilijas Farah

Postdoctoral Visitor, York University

- **Employer:** York University.
- **Date:** March 2023-May 2023.
- **Title:** Postdoctoral Visitor.
- **Supervisor:** Ilijas Farah.

Postdoc, University of Copenhagen

- **Employer:** University of Copenhagen.
- **Date:** June 2024 - present.
- **Title:** Postdoc (June 2024-February 2025), Marie Curie Fellow (April 2025-present).
- **Supervisor:** Magdalena Musat and Mikael Rørdam.

4 Publications

Published articles

1. David Jekel. The unitary group of a II_1-factor is SOT-contractible. *Math. Ann.* Published online (2025). doi:10.1007/s00208-025-03297-1, arXiv:2508.05834
2. Ben Hayes, David Jekel, and Srivatsav Kunnawalkam Elayavalli, Property (T) and strong 1-boundedness for von Neumann algebras. *J. Inst. Math. Jussieu.* Published online (2025). doi:10.1017/S1474748024000446, arXiv:2107.03278
3. Ilijas Farah, David Jekel, and Jennifer Pi. Quantum expanders and quantifier reduction for tracial von Neumann algebras. *J. Symb. Logic.* Published online (2025). doi:10.1017/jsl.2025.10100, arXiv:2310.06197
4. Anshu, David Jekel, and Therese Landry. Quantum Wasserstein distances for quantum permutation groups. *J. Geom. Phys.* 217: 105637 (2025). doi:10.1016/j.geomphys.2025.105637, arXiv:2505.19269
5. Ian Charlesworth, Rolando de Santiago, Ben Hayes, David Jekel, Srivatsav Kunnawalkam Elayavalli, Brent Nelson. Random permutation matrix models for graph products. *Doc. Math.* 30.5: 1231-1269 (2025), doi:10.4171/dm/992, arXiv:2404.07350
6. David Gao and David Jekel. Elementary equivalence and disintegration of tracial von Neumann algebras. *Forum of Math. Sigma* 13: e105 (2025), doi:10.1017/fms.2025.10066, arXiv:2410.05529
7. Ben Hayes, David Jekel, and Srivatsav Kunnawalkam Elayavalli. Consequences of the random matrix solution of the Peterson-Thom conjecture. *Anal. PDE* 18.7: 1805-1834 (2025), doi:10.2140/apde.2025.18.1805, arXiv:2308.14109
8. David Jekel. Combinatorial aspects of Parraud's asymptotic expansion for GUE matrices. *ALEA, Lat. Am. J. Probab. Math. Stat.* 22: 579-606 (2025). doi:10.30757/ALEA.v22-22, arXiv:2402.08024
9. Isaac Goldbring, David Jekel, Srivatsav Kunnawalkam Elayavalli, and Jennifer Pi. Uniformly Super McDuff II_1 factors. *Math. Ann* 391:2757-2781 (2025). arXiv:2303.02809
10. Ben Hayes, David Jekel, and Srivatsav Kunnawalkam Elayavalli. Property (T) and strong 1-boundedness for von Neumann algebras. *J. Math. Inst. Jussieu*, to appear arXiv:2107.03278

11. David Jekel and Jennifer Pi. An elementary proof of the inequality $\chi \leq \chi^*$ for conditional free entropy. *Doc. Math.* 29.5: 1085-1124 (2024) arXiv:2305.02574
12. David Jekel. Optimal transport for types and convex analysis for definable predicates in tracial W*-algebras. *J. Funct. Anal.* 287.9;110583 (2024). arXiv:2308.11058
13. Ben Hayes, David Jekel, and Srivatsav Kunnawalkam Elayavalli. Vanishing first cohomology and strong 1-boundedness for von Neumann algebras, *J. Noncommut. Geom.* 18.2:383-409 (2024). arXiv:2110.12324
14. David Jekel. Free probability and model theory of tracial W*-algebras. In *Model theory of operator algebras*, ed. Isaac Goldbring. De Gruyter, Boston, Berlin (2023).
15. David Jekel. Covering entropy for types in tracial W*-algebras, *J. Log. Anal.* 15.2:1-68 (2023). arXiv:2204.02582
16. Wilfrid Gangbo, David Jekel, Kyeongsik Nam, and Dimitri Shlyakhtenko. Duality for optimal couplings in free probability. *Comm. Math. Phys.* 396:903-981 (2022). arXiv:2105.12351.
17. David Jekel, Wuchen Li, and Dimitri Shlyakhtenko. Tracial non-commutative smooth functions and the free Wasserstein manifold. *Diss. Math.* 580:1-150 (2022). arXiv:2101.06572.
18. Ethan Davis, David Jekel, and Zhichao Wang. Tree convolution for measures with unbounded support. *Lat. Am. J. Prob. Math. Stat.* 18.2:1585-1623 (2021). arXiv:2102.01214.
19. Ben Hayes, David Jekel, Brent Nelson, and Thomas Sinclair. A Random Matrix Approach to Absorption Theorems for Free Products." *Internat. Math. Res. Not.*, 2021.3:1919–1979 (2021). arXiv:1912.11569.
20. David Jekel. Conditional Expectation, Entropy, and Transport for Convex Gibbs Laws in Free Probability. *Internat. Math. Res. Not.* 2022.6:4514-4619 (2022). arXiv:1912.11569.
21. David Jekel and Weihua Liu. An operad of non-commutative independences defined by trees. *Diss. Math.* 553:1-100 (2020). arXiv:1901.09158.
22. David Jekel. An Elementary Approach to Free Entropy Theory for Convex Potentials. *Analysis & PDE* 13.8:2289-2374 (2020). arXiv:1805.08814.
23. David Jekel. Operator-Valued Chordal Loewner Chains and Non-Commutative Probability. *Journal of Functional Analysis* 278.10:108452, arXiv:1711.02611.
24. David Jekel, Avi Levy, Will Dana, Austin Stromme, Collin Litterell. Algebraic Properties of Generalized Graph Laplacians: Critical Groups, Electrical Networks, and Homological Algebra. *SIAM J. Discrete Math.* 32.2:1040-1110 (2018). arXiv:1604.07075

Ph.D. thesis:

- David Jekel. Evolution equations in non-commutative probability. Ph.D. Thesis, UCLA, 2020.

I also wrote an appendix to the following paper:

- Terence Tao and Dimitri Shlyakhtenko, Fractional free convolution powers. *Indiana Univ. Math. J.* 71.6 (2022), 2551-2594.

Accepted articles

1. David Jekel, Lahcen Oussi, and Janusz Wysoczański. General limit theorems for mixtures of free, monotone, and boolean independence. To appear in *Electron. J. Prob.* arXiv:2407.02276
2. David Jekel. Information geometry for types in the large-n limit of random matrices. To appear in *Comm. Math. Phys.* arXiv:2501.00703
3. David Jekel and Srivatsav Kunnawalkam Elayavalli. Upgraded free independence phenomena for random unitaries. To appear in *Trans. Amer. Math. Soc.* arXiv:2404.17114
4. David A. Jekel, Todd A. Kemp, and Evangelos A. Nikitopoulos. A martingale approach to noncommutative stochastic calculus. To appear in *J. Funct. Anal.* arXiv:2308.09856
5. Ian Charlesworth, Rolando de Santiago, Ben Hayes, David Jekel, Srivatsav Kunnawalkam Elayavalli, Brent Nelson. On the structure of graph product von Neumann algebras. To appear in *Kyoto J. Math.* arXiv:2404.08150
6. Ian Charlesworth, Rolando de Santiago, Ben Hayes, David Jekel, Srivatsav Kunnawalkam Elayavalli, Brent Nelson. Strong 1-boundedness, L^2-Betti numbers, algebraic soficity, and graph products. To appear in *Publ. RIMS.* arXiv:2305.19463

Preprints

1. David Jekel, Yoonkyeong Lee, Brent Nelson, and Jennifer Pi. Strong convergence to operator-valued semicirculars. arXiv:2506.19940
2. Ian Charlesworth and David Jekel. The atoms of graph product von Neumann algebras. arXiv:2506.09000
3. Wilfrid Gangbo, David Jekel, Kyeongsik Nam, and Aaron Z. Palmer. Viscosity solutions in non-commutative variables. arXiv:2502.17329
4. Ian Charlesworth and David Jekel. Operator models and analytic subordination for operator-valued free convolution powers. arXiv:2501.09190
5. Ben Hayes, David Jekel, Srivatsav Kunnawalkam Elayavalli, and Brent Nelson. General solidity phenomena and anti-coarse spaces for type III_1 factors. arXiv:2409.18106
6. David Jekel, Juspreet Singh Sandhu, and Jonathan Shi. Potential Hessian ascent: The Sherrington-Kirkpatrick model. arXiv:2408.02360

5 Conferences

Conference and seminar organization

- Co-organizer of University of Copenhagen Groups and Operator Algebras Seminar, with Pieter Spaas, Ian Thompson, and Martín Blufstein García, 2024-2026 academic years.
- Co-organizer of JMM (Joint Mathematics Meetings) Special Session on Advances in Operator Algebras, with Sarah Browne and Priyanga Ganesan, January 2023.
- Co-organizer of IWOTA (International Workshop on Operator Theory and its Applications) special session, with Janusz Wysoczanski and Vitonofrio Crismale, September 2022.
- Co-organizer of Model Theory of Operator Algebras reading seminar, with Anshu, Fields Institute, Fall 2023.
- Co-organizer of UCSD functional analysis seminar, with Priyanga Ganesan, 2022-2023 academic year.
- Organizer of UCSD functional analysis seminar, 2021-2022 academic year.

Selected conferences with invited talks

- Abu Dhabi Stochastics Days, December 6, 2024.
- Non-commutative Function Theory and Free Probability, Mathematische Forschungsinstitut Oberwolfach, April/May 2024.
- Workshop on Operator Algebras and Applications: Free Probability, Fields Institute, November 2023.
- Virginia Operator Theory and Complex Analysis Meeting, University of Richmond, October 2023.
- Workshop on Operator Algebras and Applications: Connections with Logic, Fields Institute, August-September 2023.
- Workshop on Operator Algebras and Applications: Connections with Logic, Fields Institute, Toronto, August 2023.
- von Neumann algebras follow-up workshop to trimester program, Hausdorff Institute of Mathematics, Bonn, August 2022.
- C^*-algebras workshop, Mathematisches Forschungsinstitut Oberwolfach, August 2022.
- Operator Algebras, Dynamics, and Groups, ICM Satellite Conference, University of Copenhagen, July 2022.
- AMS sectional meeting, Recent, Developments in Operator Algebras, virtual, March 26-27, 2022.
- Southern California Probability Symposium, virtual, December 11, 2021.

Selected conferences with contributed talks

- World Congress of Probability and Statistics, Ruhr-Universität Bochum, August 2024.[1]
- Glasgow Late August Symbolic Dynamics, Groups, and Operators Workshops, University of Glasgow, August 2022.
- IPAM Quantitative Linear Algebra, second reunion conference, December 2021.
- Operator Theory with Its Applications, virtual, August 10-13, 2020.
- Real Algebraic Geometry with a View Toward Hyperbolic Programming and Free Probability, Oberwolfach, March 1 - 7, 2020.
- Classification Problems in von Neumann Algebras, BIRS, September 2019.
- C*-algebras at Mathematische Forschungsinstitut Oberwolfach, August 2019.
- International Workshop on Operator Theory and its Applications, Instituto Superior Tecnico, Lisbon, July 2019.
- Great Plains Operator Algebras Symposium, Texas A & M University, May 2019.
- West Coast Operator Algebras Seminar, Seattle University, September 2018.
- Young Mathematicians in C*-algebras, KU Leuven, August 2018.
- Extended Probabilistic Operator Algebras Seminar, University of California, Berkeley, November 2017.

Selected Conferences Attended

- Group Operator Algebras: Classification, Structure and Rigidity, Banff International Research Station / virtual, September 2024.
- Stochastics and Geometry, Banff International Research Station / virtual, September 2024.
- Non-commutativity in the North: MikaelFest,[2] June 2024.
- Thematic program on Operator Algebras, Fields Institute, Toronto, Fall 2023.
- Southeastern Analysis Meeting, virtual, March 17-18, 2021.
- Joint Mathematics meetings, virtual, January 2021.
- Young Mathematicians in C*-algebras, University of Copenhagen, August 2019.
- Model Theory and Operator Algebras, BIRS, November 2018.
- Long Program in Quantitative Linear Algebra at IPAM, Spring 2018.
- Model Theory of Operator Algebras workshop, University of California, Irvine, September 2017.
- Dyson-Schwinger Equation workshop, Columbia University, September 2017.
- Workshop in Subfactors and Planar Algebras, MSRI, June 2017.
- Complex Analysis and Probability Workshop, Montana State University, August 2016 and 2017.
- Summer School in Analysis at the University of Chicago, Summer 2014 and Summer 2016.
- Train Tracks Seminar, University of Utah, Summer 2014.
- Summer Mathematics REU, University of Washington, Summer 2013.

6 Teaching Experience

Teaching Assistant at U of Copenhagen

In Block 3 (February and March) 2025, I was a teaching assisant for the course Operator Algebras, for master's students. I led exercise sessions and graded homework.

[1] Invited talk for a contributed session.
[2] Conference in honor of Mikael Rørdam's 65th birthday.

Lecturer at UCSD

See the teaching statement for more detail. I taught the following courses:

- Math 10C Multivariable calculus (for non-physical science majors) (Spring 2022)
- Math 109 Introduction to Mathematical Reasoning (Winter 2022).
- Math 180A Introduction to Probability Theory (Fall 2021, Fall 2022).
- Math 130 Ordinary Differential Equations and Dynamical Systems (Winter 2023).
- Math 146 Analysis of Ordinary Differential Equations (Spring 2023).

I also have the following experience and qualifications from my work at UCSD:

- Excellent teaching reviews from students.
- Attended workshops from the Engaged Teaching Hub from the Teaching and Learning Commons.
- Proficient at using technology for in-person, hybrid, and remote instruction: Canvas, Gradescope, Piazza, Discord, Padlet, Mentimeter, iPad, Goodnotes, Zoom.
- Experienced in teaching large classes (150-200 students in lower division, 70 students in upper division).
- High student engagement using interactive techniques in lecture, participation points, office hours, and individual meetings.
- Mastery-based assessment through allowing students to correct or replace a certain number of problems/topics.

Teaching Assistant at UCLA

Duties include teaching discussion section, grading, and holding office hours, as well as tutoring in the Student Math Center (for the lower division classes). Classes include

- Math 33A Linear Algebra (Fall 2015, Winter 2016).
- Math 33B Differential Equations (Winter 2018).
- Math 61A Discrete Structures (Fall 2017).
- Math 131A Analysis (Spring 2016).
- Math 131B Analysis (Fall 2016, Winter 2017, Winter 2019).
- Math 131C Topics in Analysis (Spring 2019).
- Math 275A Probability (graduate-level, Fall 2016).

Teaching Assistant at University of Washington

First-year honors calculus sequence (Math 134, 135, 136) in 2013-2014, and second-year sequence (Math 334, 335, 336) in 2014-2015. Duties include teaching one class per week, grading quizzes, grading homework, and holding two office hours.

Mentorship and professional development

- I co-supervised the master's thesis of Sophia Stone at University of Copenhagen in spring and summer 2025.
- Since 2023, I am a member of the Operator Algebras Mentor Network which supports early-career researchers in operator algebras who are underrepresented with respect to gender.
- During 2020-2021 I regularly participated in the meetings of OTTER (Operator Theory Talks for Early-Career Researchers), which is a group of in operator theory and related fields meant to equip young researchers with mathematical background and career development.

- I am currently meeting individually with some undergraduates and graduate students to give reading courses or collaborate on research projects.
- I was a judge for the Mathematical Association of America's poster contest in the 2021 Joint Mathematics Meetings.

7 Outreach

San Diego Refugee Tutoring

During the 2020-2023 academic years, I volunteered as a tutor regularly on Tuesdays and Thursdays for San Diego Refugee Tutoring, an organization that tutors kids of refugee backgrounds in the City Heights neighborhood of San Diego. We helped kids with their homework and read with them in order to support their education and thriving in their new home. We also had events a couple times a year where kids have fun and receive food donations.

8 Awards and Honors

- Marie Skłodowska-Curie Fellowship from the EU Horizon programme, March 2025-present.
- Oberwolfach Simons Visiting Professor travel grant for the workshop "Free probability and non-commutative function theory" and visit to the University of Wrocław, May 2023.
- Postdoc fellowship from the National Science Foundation (2020-2023).
- Dissertation Year Fellowship from UCLA (2019-2020).
- Graduate Division Dean's Scholarship from UCLA.
- Dean's Medal for Natural Sciences at the UW (2015).
- Gullicksen Award for outstanding juniors in the UW math department (2013-2014).
- Jim Greenfield Classics scholarship at the UW.
- UW Freshman Presidential Medalist (2011-2012).
- National Merit Scholar (2011).