

Contact Information

·Address: 257A Altgeld Hall (MC-382), Department of Mathematics, University of Illinois at Urbana-Champaign, 1409 West Green Street, Urbana, Illinois, 61801 USA

·email: raraiza [at] illinois [dot] edu

Employment

1. J.L. Doob Research Assistant Professor *with Marius Junge* August 2021-Current
Department of Mathematics, University of Illinois at Urbana-Champaign

Education

- Ph.D., Mathematics, Purdue University August 2015- April 2021
Thesis: "On the abstract structure of operator systems and applications to quantum information theory"
Advisor: Thomas J. Sinclair
- B.A., Mathematics, San José State University December 2014
Advisor: Timothy Hsu

Appointments

5. Institute Affiliate August 2021-Current
Illinois Quantum Information Science and Technology Center
4. J.L. Doob Research Assistant Professor August 2021-Current
Department of Mathematics, University of Illinois at Urbana-Champaign
3. Purdue Research Foundation Fellow June 2019-June 2020
Department of Mathematics, Purdue University
2. GAANN Fellow January 2016-January 2018
Department of Mathematics, Purdue University
1. Andrews Fellow of Mathematics August 2015-December 2020
Department of Mathematics, Purdue University

Visiting Research Positions/Extended Stays

3. Visiting Researcher June-July 2022
Mathematisches Institut WWU Münster
2. Thematic Research Program: Operator Algebras, Groups and Applications May 2019
to Quantum Information, Instituto de Ciencias Matematicas, Madrid, Spain
1. Long Program on Quantitative Linear Algebra, Institute for Pure March-June 2018
and Applied Mathematics, University of California, Los Angeles, California, USA

Short Research Visits

7. Department of Computer Science, Columbia University, Host: Henry Yuen December 2022
6. Department of Mathematics, University of Virginia, Host: Ben Hayes April 2022
5. Army Cyber Institute, United States Military Academy, West Point February 2020
Host: Travis Russell

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| 4. Department of Mathematics, University of Illinois at Urbana-Champaign
Host: Marius Junge | October 2019 |
| 3. Department of Mathematics, University of Virginia, Host: Ben Hayes | October 2019 |
| 2. Department of Mathematics, Sam Houston State University, Host: Damon Hay | March 2019 |
| 1. Department of Mathematics, Texas A&M, Host: Gilles Pisier | March 2019 |

Research Visitors

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| 2. Graeme Smith, University of Colorado Boulder | April 2023 |
| 1. Alexander Müller-Hermes, University of Oslo | November 2022 |

Research Interests

My research interests lie at the intersection of operator space theory and quantum information theory.

- Tensor theory of operator spaces
- Tensor theory of operator systems
- Local structure of operator spaces and operator systems
- Quantum games
- Quantum error correction

Publications and Preprints

6. An index for inclusions of operator systems (with Colton Griffin and Thomas Sinclair) (2022). arXiv:2203.05710. Submitted
5. Approximating projections by quantum operations (with Colton Griffin, Aneesh Khilnani, and Thomas Sinclair) (2022) arXiv:2203.02627. To appear: Linear Algebra and Its Applications
4. Matricial Archimedean order unit spaces and quantum correlations (with Travis Russell and Mark Tomforde). (2021) arXiv:2109.11671. To appear: Indiana University Mathematics Journal
3. A universal representation for quantum commuting correlations (with Travis Russell and Mark Tomforde). (2021) arXiv:2102.05827. Published: Annales Henri Poincaré (2022) DOI: 10.1007/s00023-022-01197-7
2. An abstract characterization for projections in operator systems (with Travis Russell). (2020) arXiv:2006.03094. To appear: Journal of Operator Theory
1. \mathcal{R} we living in the matrix? (with Rolando de Santiago). Notices of the American Mathematical Society. Volume 66, Number 8, (2019), Pgs. 1216-1224.

Honors and Awards

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| 6. AMS Travel Grant
American Mathematical Society | March 2020 |
| 5. Purdue Research Foundation Grant
Department of Mathematics, Purdue University | June 2019 |

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| 4. GAANN Fellowship
Department of Mathematics, Purdue University | January 2016 |
| 3. Andrews Fellowship
Department of Mathematics, Purdue University | August 2015 |
| 2. Mervin L. Keedy Scholarship
Department of Mathematics, Purdue University | August 2015 |
| 1. College of Science Dean's Scholar
College of Science, San Jose State University | December 2014 |

Invited Lectures

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| 30. Lecture, Operator Algebras Seminar, Purdue University
Title: TBD | April 2023 |
| 29. Lecture, Quantum Information and Computing Seminar, University of Delaware
Title: An Index for Inclusions of Operator Systems | November 2022 |
| 28. Research Scholars Seminar, Discovery Partners Institute, Chicago, IL
Title: Quantum Information Theory: an intro from the theoretical viewpoint | September 2022 |
| 27. Lecture Series, KnOttawa Summer School 2022, Kansas State University
Lecture Series Topic: Quantum Information Theory | July 2022 |
| (a) Lecture 1: The Postulates of Quantum Mechanics Part I | |
| (b) Lecture 2: The Postulates of Quantum Mechanics Part II | |
| (c) Lecture 3: Quantum Operations and Quantum Noise Part I | |
| (d) Lecture 4: Quantum Operations and Quantum Noise Part II | |
| (e) Lecture 5: Quantum Error Correction | |
| 26. Kleines Seminar, WWU Münster,
Title: The Postulates of Quantum Mechanics and Further Observations | June 2022 |
| 25. Oberseminar C^* -algebren, WWU Münster,
Title: A Universal Representation for Quantum Commuting Correlations | June 2022 |
| 24. Operator Theory Seminar, University of Virginia
Title: Matricial Archimedean Order Unit Spaces and Quantum Correlations | April 2022 |
| 23. AMS Spring Southeastern Sectional Meeting on "Advances in Operator Algebras"
University of Virginia
Title: TBD (Meeting Canceled) | March 2022 |
| 22. Plenary Lecture, Southeastern Analysis Meeting, University of Florida
Title: Matricial Archimedean Order Unit Spaces and Quantum Correlations | March 2022 |
| 21. Functional Analysis Seminar, University of California San Diego
Title: Matricial Archimedean Order Unit Spaces and Quantum Correlations | February 2022 |
| 20. Department of Mathematics & Statistics Colloquium, San José State University
Title: From Correlation Sets to Tensor Products of C^* -algebras: The Connes-Kirchberg Problem | September 2021 |
| 19. Expository Lecture Series, Groundwork for Operator Algebras Lecture Series (GOALS),
Michigan State University, East Lansing, Michigan | July 2021 |

- (a) Lecture 1: Completely Positive Maps and Applications
 - (b) Lecture 2: Lance's Weak Expectation Property and Kirchberg's Conjecture
18. Special Session on Advances in Operator Algebras, Joint Mathematics Meeting
Washington D.C.
Title: An Abstract Characterization for Projections in Operator Systems January 2021
 17. Special Session: "If You Build It They Will Come": Presentations by Scholars in the
National Alliance for Doctoral Studies in the Mathematical Sciences,
Joint Mathematics Meeting, Washington D.C.
Title: A Look into the Abstract Theory of Operator Systems and Some Applications
to Quantum Information Theory January 2021
 16. Operator Theory Seminar, University of Iowa November 2020
Title: Projections in Operator Systems and Applications to Quantum
Information Theory
 15. East Coast Operator Algebras Symposium, University of Virginia October 2020
Title: Projections in Operator Systems and Applications to Quantum
Information Theory
 14. Mathematical Physics and Operator Algebras Seminar, Michigan State University September 2020
 - (a) Lecture 1: Operator Spaces and Operator Systems: An Exposition.
 - (b) Lecture 2: An Abstract Characterization for Projections in Operator Systems.
 13. Rings and Wings Seminar, Algebras and Rings in Colorado Springs Center (ARCS) September 2020
University of Colorado at Colorado Springs
Title: An Abstract Characterization for Projections in Operator Systems
 12. Oberseminar C^* -algebren, WWU Münster, June 2020
Title: An Abstract Characterization for Projections in Operator Systems
 11. 2TART Conference, University of Florida June 2020
Title: An Abstract Characterization for Projections in Operator Systems
 10. Operator Algebras Mini-Workshop, University of Virginia March 2020
Title: On Operator Systems Containing Symmetries
 9. Quantitative Linear Algebra Reunion Conference at Lake Arrowhead, Institute
for Pure and Applied Mathematics, University of California, Los Angeles December 2019
Title: Tensor Products and Categorical Properties of Matrix Convex Sets
 8. Analysis Seminar, University of Illinois at Urbana-Champaign October 2019
Title: Matrix Convex Sets, Tensor Products, and Noncommutative
Choquet Boundaries
 7. Operator Theory Seminar, University of Virginia October 2019
Title: Matrix Convex Sets, Tensor Products, and Noncommutative
Choquet Boundaries
 6. Mathematics Colloquium, Sam Houston State University March 2019
Title: On Operator Spaces and Submaximality
 5. Linear Analysis Seminar, Texas A&M March 2019
Title: On Operator Systems and Matrix Convexity
 4. Quantitative Linear Algebra Culminating Workshop at Lake Arrowhead June 2018
University of California, Los Angeles
Title: Lance's Weak Expectation Property and The Tensor Theory of Operator Systems

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| 3. Quantitative Linear Algebra General Seminar Series, Institute for Pure and Applied Mathematics, University of California, Los Angeles
Title: Characterizations of Operator Systems Via Tensor Product Nuclearity Part II | April 2018 |
| 2. Quantitative Linear Algebra General Seminar Series, Institute for Pure and Applied Mathematics, University of California, Los Angeles
Title: Characterizations of Operator Systems Via Tensor Product Nuclearity Part I | April 2018 |
| 1. Department of Mathematics and Statistics Colloquium, San José State University
Title: C^* -Algebras and Real Operator Systems | April 2015 |

Contributed

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| 5. Early Career Workshop in Operator Theory & Operator Algebras, Indiana University and Purdue University
Title: A Universal Representation for Quantum Commuting Correlations | February 2021 |
| 4. Wabash Annual Mini-Conference, IUPUI, Indianapolis, IN
Title: Matrix Convex Sets, Tensor Products, and Noncommutative Choquet Boundaries | September 2019 |
| 3. Graduate Research Day, Purdue University
Title: Lance's WEP and Operator System Nuclearity | November 2018 |
| 2. Northern California Undergraduate Mathematics Conference, Saint Mary's College
Title: Real Operator Systems in M_n | March 2015 |
| 1. American Mathematical Society Joint Mathematics Meetings, AMS Session on Functional Analysis
Title: Real Operator Systems in M_n | January 2015 |

Conferences/Workshops Attended

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| 30. Functional Analysis and Quantum Information, Quantum Information Theory 2023
Instituto de Ciencias Matemáticas, Madrid, Spain | March 2023 |
| 29. Wabash Annual Mini-Conference, IUPUI, Indianapolis, IN | November 2022 |
| 28. QLA Meets QIT II, Illini Center, University of Illinois at Urbana-Champaign
Illinois Quantum Information Science and Technology Center
Chicago Quantum Exchange | November 2022 |
| 27. Operator Algebras, Dynamics, and Groups. ICM Satellite Conference
University of Copenhagen | July 2022 |
| 26. Advancing Quantum Mechanics with Mathematics and Statistics, IPAM
University of California Los Angeles | March-June 2022 |
| (a) Workshop IV: Monte Carlo and Machine Learning Approaches
in Quantum Mechanics | May 2022 |
| (b) Workshop III: Large-scale Certified Numerical Methods in Quantum Mechanics | May 2022 |
| (c) Workshop II: Model Reduction in Quantum Mechanics | April 2022 |
| (d) Workshop I: Multiscale Approaches in Quantum Mechanics | March-April 2022 |
| 25. AMS Spring Central Sectional Meeting on "Recent Developments in Operator Algebras", Purdue University | March 2022 |

24. AMS Spring Southeastern Sectional Meeting on “Advances in Operator Algebras” University of Virginia (Meeting Canceled)	March 2022
23. Southeastern Analysis Meeting, University of Florida	March 2022
22. Groundwork for Operator Algebras Lecture Series, Michigan State University	July 2021
21. Early Career Workshop in Operator Theory & Operator Algebras Indiana University and Purdue University	February 2021
20. Entropy Inequalities, Quantum Information and Quantum Physics Institute for Pure and Applied Mathematics, University of California, Los Angeles	February 2021
19. Joint Mathematics Meeting, Washington D.C.	January 2021
18. East Coast Operator Algebras Symposium, University of Virginia	October 2020
17. Groundwork for Operator Algebras Lecture Series (GOALS) Michigan State University	June-July 2020
(a) Groundwork for Operator Algebras Lecture Series (GOALS) Culminating Workshop	July 2020
16. Noncommutative Geometry and Operator Algebras Spring Institute Vanderbilt University	May 2020
15. Operator Algebras Mini-Workshop, University of Virginia	March 2020
14. Quantitative Linear Algebra Reunion Conference at Lake Arrowhead, Institute for Pure and Applied Mathematics, University of California, Los Angeles, USA	December 2019
13. QLA Meets QIT, Purdue University	November 2019
12. Classification Problems in von Neumann Algebras, Banff International Research Station for Mathematical Innovation and Discovery (BIRS)	September 2019
11. Wabash Mini-Conference, IUPUI	September 2019
10. Thematic Research Program: Operator Algebras, Groups and Applications to Quantum Information, Visiting Researcher, Instituto de Ciencias Matemáticas, Madrid, Spain	May 2019
(a) Workshop II: Mathematical Aspects of Quantum Information Theory	May 2019
(b) School II: Applications to Quantum Information Theory	May 2019
9. Brazos Analysis Seminar, University of Houston	March 2019
8. Wabash Mini-Conference, IUPUI	September 2018
7. Quantitative Linear Algebra, Visiting Scholar/Researcher, Institute for Pure and Applied Mathematics, University of California, Los Angeles	March-June 2018
(a) Workshop IV: Quantitative Linear Algebra Culminating Workshop	June 2018
(b) Workshop III: Random Matrices and Free Probability	May 2018
(c) Workshop II: Approximation Properties in Operator Algebras and Ergodic Theory	May 2018
(d) Workshop I: Expected Characteristic Polynomial Techniques and Applications	April 2018
6. Classification of Group von Neumann Algebras, American Institute of Mathematics, San Jose, California, USA	January 2018
5. Wabash Mini-Conference, IUPUI	September 2017

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| 4. East Coast Operator Algebras Seminar, Loyola University | October 2016 |
| 3. Workshop on Non-Commutative Analysis, University of Iowa | June 2016 |
| 2. Great Plains Operator Theory Symposium, University of Illinois at Urban-Champaign | May 2016 |
| 1. East Coast Operator Algebras Seminar, University of Iowa | October 2015 |

Other Conferences Attended/Outreach

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| 9. Panelist, Finding and Getting Jobs: A Panel Discussion
Purdue University | April 2021 |
| 8. Q&A Moderator, Fields of Success, Stories from Math Alliance Alumni
Math Alliance Field of Dreams Conference, Institute for Mathematics
and its Applications, University of Minnesota (virtual) | November 2020 |
| 7. Panelist, Grad School Life, Career Paths in the Mathematical Sciences: An
IMA/Math Alliance Workshop, Institute for Mathematics and its Applications,
University of Minnesota, USA | July 2020 |
| 6. Panelist, Finding Your Focus in Graduate School: The Many Focuses of a
Math Sciences PhD., Career Paths in the Mathematical Sciences: An IMA/Math Alliance
Workshop, Institute for Mathematics and its Applications, University of Minnesota, USA | June 2019 |
| 5. Panelist, Maximizing Opportunities, Math Alliance Field of Dreams,
St. Louis, USA | November 2018 |
| 4. Math Alliance Field of Dreams Conference, St. Louis, USA | November 2018 |
| 3. Latinos in the Mathematical Sciences, Institute for Pure and
Applied Mathematics, University of California, Los Angeles | March 2018 |
| 2. Math Alliance Field of Dreams Conference, St. Louis, USA | November 2017 |
| 1. Math Alliance Field of Dreams Conference, St. Louis, USA | November 2016 |

Teaching

University of Illinois at Urbana-Champaign

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| • Math 595: Operator Space Theory | Spring 2023 |
| • Math 492: Quantum Channels and Error Correction II | Spring 2023 |
| • Math 415: Applied Linear Algebra | Spring 2023 |
| • Math 492: Quantum Channels and Error Correction (8 students) | Fall 2022 |
| • Math 415: Applied Linear Algebra (280 students) | Fall 2022 |
| • Math 492: Select Topics in Quantum Information Theory (16 students) | Spring 2022 |
| • Math 415: Applied Linear Algebra (280 students) | Spring 2022 |
| • Math 125: Elementary Linear Algebra (80 students) | Fall 2021 |

Purdue University

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| • Math 16200 Plane Analytic Geometry And Calculus II (Recitation) | Summer 2021 |
| • Math 16010 Applied Calculus 1 (Instructor) | Spring 2021 |
| • Math 26100 Multivariate Calculus (Recitation) | Fall 2017 |
| • Math 16600 Analytic Geometry and Calculus II (Recitation) | Spring 2017 |

Advising

University of Illinois at Urbana-Champaign

Graduate

Undergraduate

- Jihong Cai, Mathematics August 2022-Current
- Abraham Holtermann, Physics August 2022-Current
- Chieh Hsu, Physics May 2022-Current

Service

- Seminar Committee Member, Illinois Quantum Information Science and Technology Center (IQUIST), University of Illinois at Urbana-Champaign August 2022-Current
- Scholarship Board Member, Sloan University Center of Exemplar Mentoring at Illinois University of Illinois at Urbana-Champaign September 2021-Current
- Mentor, Sloan University Center of Exemplar Mentoring at Illinois University of Illinois at Urbana-Champaign September 2021-Current
- TA, Groundwork for Operator Algebras Lecture Series (GOALS) Michigan State University June-July 2020

Conferences/Seminars Organized:

8. Co-Organizer (with Marius Junge, Felix Leditzky and Thomas Sinclair) November 2022
QLA Meets QIT II
University of Illinois at Urbana-Champaign, Illinois Quantum Information Science and Technology Center, Chicago Quantum Exchange
7. Co-Organizer (with Rolando de Santiago, Thomas Sinclair and Andrew Toms) March 2022
AMS Spring Central Sectional Meeting on "Recent Developments in Operator Algebras"
Purdue University
6. Co-Organizer (with Marius Junge) August 2021-Current
Operator Algebras Seminar
University of Illinois at Urbana-Champaign
5. Co-Organizer (with Thomas Sinclair), QLA Meets QIT November 2019
Purdue University
4. Co-Organizer (with Marius Dadarlat and Thomas Sinclair) August 2019-May 2021
Operator Algebras Seminar
Purdue University
3. Organizer, Junior Operator Algebras Seminar August 2018-May 2021
Purdue University
2. Organizer, Quantitative Linear Algebra General Seminar Series March 2018-June 2018
Institute for Pure and Applied Mathematics
University of California, Los Angeles

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| 1. Organizer, Quantitative Linear Algebra Open Problem Session
Institute for Pure and Applied Mathematics
University of California, Los Angeles | March 2018-June 2018 |
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Other:

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| • Graduate Student Representative
Department of Mathematics, Purdue University | August 2017-May 2018 |
| • Chapter President, Purdue University AMS Student Chapter
Purdue University | August 2017-May 2018 |

References

- Marius Dadarlat, Professor of Mathematics, Purdue University,
email: dadarlat [at] purdue [dot] edu
- Marius Junge, Professor of Mathematics, University of Illinois at Urbana-Champaign,
email: mjunge [at] illinois [dot] edu
- Vern Paulsen, Professor of Mathematics, University of Waterloo
email: vpaulsen [at] uwaterloo [dot] ca
- Gilles Pisier, Distinguished Professor of Mathematics, Texas A&M, Professor Emeritus of Mathematics,
Sorbonne Université,
email: gilles [dot] pisier [at] imj-prg [dot] fr
- Thomas J. Sinclair, Associate Professor of Mathematics, Purdue University,
email: tsincla [at] purdue [dot] edu