Zhe Liu — Curriculum Vitae

Assistant Professor of Mathematics

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Education

- 2005 - 2010 Ph.D. in Mathematics, University of New Hampshire
  - Doctoral Advisors:

    Richard V. Kadison
    Gustave C. Kuemmerle Professor of Mathematics, University of Pennsylvania
    Member, National Academy of Sciences, U.S.A.

    Liming Ge
    Professor of Mathematics, University of New Hampshire
    L. K. Hua Research Chair, Academy of Mathematics and Systems Science, Chinese Academy of Sciences
  - Dissertation: Von Neumann Algebras, Affiliated Operators and Representations of the Heisenberg Relation.
- 1999 - 2003 B.S. in Mathematics, Hebei Normal University, China

Employment

2013 - present Assistant Professor (tenure-track), University of Central Florida
2012 - 2013 Postdoc, University of Denver
2010 - 2012 Lecturer (postdoc), University of Pennsylvania

Honors and Awards

2011 Good Teaching Award. Department of Mathematics, University of Pennsylvania.
2009 Graduate Student Teaching Award. University of New Hampshire.
2007 Summer Graduate Teaching Assistant Fellowship. University of New Hampshire.
2003 First Prize, National Scholarship. Ministry of Education, China.
2002 First Prize, University Scholarship. Hebei Normal University.
2001 First Prize, Teaching Skills Competition. Hebei Normal University.
2001 All-around Teaching Competition Champion. College of Mathematics and Information Science, Hebei Normal University.
2001 First Prize, University Scholarship. Hebei Normal University.
2001 Third Prize, National English Contest for College Students. China.
2001 Third Prize, English Speaking Contest of College Students. Hebei Province, China.
2000 Second Prize, University Scholarship. Hebei Normal University.

Research Interests

Functional analysis
Operator algebras
Mathematical physics
Applications of quantum methods in physical sciences

Publications (all peer reviewed)

- Yanni Chen, Don Hadwin, Zhe Liu and Eric Nordgren, *A Beurling Theorem for Generalized Hardy Spaces on a Multiply Connected Domain*, Canadian Journal of Mathematics, https://cms.math.ca/10.4153/CJM-2017-007-8.

- Zhe Liu, *Reflexivity of Murray – von Neumann Algebras*, in Operator Algebras and Their Applications, Contemporary Mathematics, vol. 671, American Mathematical Society, Providence, RI, 2016, 175-184.

- Richard Kadison and Zhe Liu, *Derivations of Murray – von Neumann Algebras*, Mathematica Scandinavica, **115** (2014), no. 2, 206-228.

- Richard Kadison and Zhe Liu, *A Note on Derivations of Murray – von Neumann Algebras*, Proceedings of the National Academy of Sciences of the United States of America (PNAS), **111** (2014), 2087-2093.

- Richard Kadison and Zhe Liu, *The Heisenberg Relation – Mathematical Formulations*, Symmetry, Integrability and Geometry : Methods and Applications (SIGMA), **10** (2014), 009, 40 pages.

- Don Hadwin, Zhe Liu and Eric Nordgren, *Closed Densely Defined Operators Commuting with Multiplications in a Multiplier Pair*, Proceedings of the American Mathematical Society(PAMS), **141** (2013), 3093-3105.

- Zhe Liu, *A Double Commutant Theorem for Murray – von Neumann Algebras*, Proceedings of the National Academy of Sciences of the United States of America (PNAS), **109** (2012), 7676-7681.

- Zhe Liu, *On some mathematical aspects of the Heisenberg relation*, Science China Mathematics, **54** (2011), 2427-2452.

  ◦ Richard Kadison, Zhe Liu and Andreas Thom, *Commutators in algebras of unbounded operators*, in preparation.

  ◦ Zhe Liu, *Simultaneous Diagonalization of Murray – von Neumann Algebras*, in preparation.

Presentations

- *Derivations, Commutators, and Reflexivity of Murray-von Neumann Algebras*
  Organizer and speaker.
  AMS Fall Southeastern Sectional Meeting, Special Session on Operator Algebras and Related Topics, University of Central Florida, September, 2017.

- *On some Mathematical Aspects in Quantum Mechanical Approaches: from Theoretical Foundations to Applications in Environmental Systems*
  Invited speaker.
  Duke University, June, 2017.

- *Some mathematical aspects of the Heisenberg Relation and recent developments in the theory of unbounded operators*
  Plenary Short Talk*.
  QMath13: Mathematical Results in Quantum Physics, Georgia Institute of Technology and Emory University, October, 2016. * unable to attend due to hurricane weather

- *Reflexivity — some history and some new results*
  Analysis Seminar, University of Central Florida, February, 2016.

- *Permutation Polytopes*
  Discrete Math Seminar, University of Central Florida, April, 2015.

- *Commutators — some history and some new results*
  Analysis Seminar, University of Central Florida, March, 2015.

- *Recent developments in the theory of Murray-von Neumann algebras*
  Invited speaker.
  2015 Joint Mathematics Meetings, AMS Special Session on Operator Algebras and Their Applications: A Tribute to Richard V. Kadison, San Antonio, January, 2015.

- *Commutators and Polytopes*
  Invited speaker.
  AMS Fall Central Sectional Meeting, Special Session on von Neumann Algebras and Related Fields, University of Wisconsin-Eau Claire, September, 2014.

- *The Bernstein Polynomials*
  Analysis Seminar, University of Central Florida, April 2014.

- *Derivations and Commutators in Algebras of Affiliated Operators*
  Invited speaker.

AMS Spring Western Sectional Meeting, Special Session on Progress in Noncommutative Analysis, University of New Mexico, April, 2014.

- *Murray – von Neumann Algebras — An Overview*
  Analysis Seminar, University of Central Florida, January, 2014.

- *On the Foundations of Murray – von Neumann Algebras*
  Department Colloquium, University of Central Florida, February, 2013.

- *On the Foundations of Murray – von Neumann Algebras I*
  Analysis and Dynamics Seminar, University of Denver, October, 2012.

- *On the Foundations of Murray – von Neumann Algebras II (Derivations)*
  Analysis and Dynamics Seminar, University of Denver, October, 2012.

- *An Introduction to Operator Algebras, Unbounded Operators, and their relations to Physics*
  Graduate Colloquium, University of Denver, October, 2012.

- *A Double Commutant Theorem for Murray – von Neumann Algebras*
  Invited speaker*.
  International Workshop on Operator Theory and Applications (IWOTA), Topics in Noncommutative Analysis (thematic session), University of New South Wales, Sydney, Australia, July, 2012. * unable to attend due to schedule conflict

- *Notes on Murray – von Neumann Algebras*
  Great Plains Operator Theory Symposium, Arizona State University, May, 2011.

- *Mathematical Aspects of the Heisenberg Relation*
  Invited speaker.
  Analysis Seminar, University of Illinois at Urbana-Champaign, September, 2010.

- *The Heisenberg Relation*
  Analysis Seminar, University of Pennsylvania, September, 2010.

- *The Heisenberg – von Neumann Puzzle & The von Neumann – Heisenberg Puzzle*
  Invited speaker.
  International Conference on Operator Algebras and Related Topics, Academy of Mathematics and System Sciences, Chinese Academy of Sciences, July, 2010.

- *The von Neumann – Heisenberg Puzzle*
  Great Plains Operator Theory Symposium, University of Denver, June, 2010.

- *Unbounded Operators Affiliated with Factors of Type II_1*
  Ph.D. Major presentation, November, 2008.

- *Classification of Covering Spaces*
  Ph.D. Minor (Algebraic Topology) presentation, December, 2007.

Other (STEM education, outreach, etc.):

- *Forming a discipline-specific learning community to implement active learning over a diverse range of calculus courses*
  (with two other Math faculty members)
  Summer Faculty Development Conference, UCF, May, 2017.

- *The Kaleidoscope of Mathematics*
  UCF Mathematics Career Exploration Day, November, 2015.

- *CAMP-YES: Our Team*
  Mentor guest speaker, CAMP-YES (Career Advancement Mentoring Program for Young Entrepreneur and Scholars) Social, October, 2015.

Teaching Experience (with teaching evaluations listed)

- **Teaching as Sole Instructor**:

  University of Central Florida

  - MAS 5145 Advanced Linear Algebra and Matrix Theory (Fall 2017)
  - MAC 2311H Honors Calculus with Analytic Geometry I (Fall 2017)
  - MAA 6506 Functional Analysis (Spring 2017) 4.33/5
  - MAC 2313 Calculus with Analytic Geometry III (Spring 2017) 4.29/5
  - MAC 2313 Calculus with Analytic Geometry III (Fall 2016) 4.64/5
  - MAS 5145 Advanced Linear Algebra and Matrix Theory (Fall 2016) 4/5
  - MAC 2312 Calculus with Analytic Geometry II (Summer 2016) 4.19/5
  - MAA 5210 Topics in Advanced Calculus (Spring 2016) 4/5
  - MAP 2302 Ordinary Differential Equations I (Fall 2015) 4.74/5
  - MAC 2313H Honors Calculus with Analytic Geometry III (Fall 2015) 4.93/5
  - MAC 2313 Calculus with Analytic Geometry III (Summer 2015) 4.68/5
  - MTG 4302 Introduction to Topology (Spring 2015) 5/5
  - MAS 3106 Linear Algebra (Spring 2015) 4.32/5
  - MAP 4303 Ordinary Differential Equations II (Fall 2014) 4.62/5
  - MAP 2302 Ordinary Differential Equations I (Summer 2014) 4.85/5
  - MAS 3106 Linear Algebra (Spring 2014) 4.83/5
  - MAC 2312H Honors Calculus with Analytic Geometry II (Spring 2014) 4.69/5
  - MAC 2312H Honors Calculus with Analytic Geometry II (Fall 2013) 4.64/5

University of Denver

- Math 1953 Calculus III (Spring 2013) 5.82/6
- Math 1952 Calculus II (Winter 2013) 5.20/6
- Math 1951 Calculus I (Autumn 2012) 3.75/6

University of Pennsylvania *Good Teaching Award*

- Math 241 Calculus IV (Spring 2012) 3.20/4
- Math 170 Ideas In Mathematics (Fall 2011) 2.81/4
- Math 361 Advanced Calculus II (Spring 2011) 3.86/4
- Math 360 Advanced Calculus I (Fall 2010) 3.33/4

University of New Hampshire *Graduate Student Teaching Award*

- Math 425 Calculus for Engineering and Physical Sciences I (Spring 2009) 4.70/5
- Math 426 Calculus for Engineering and Physical Sciences II (Fall 2008) 4.77/5
- Math 425 (Summer 2008) 4.75/5
- Math 426 (Fall 2007) 4.87/5
- Math 425 (Summer 2006) 4.83/5

- **Teaching as Teaching Assistant**:

University of Pennsylvania

- Math 114 Calculus II (Spring 2010) 3.22/4
- Math 104 Calculus I (Fall 2009) 2.94/4

University of New Hampshire *Summer GTA Fellowship for good teaching*

- Math 424 Calculus for Social and Life Sciences (Spring 2007) 4.80/5
- Math 426 (Fall 2006) 4.70/5
- Math 426 (Spring 2006) 4.23/5
- Math 425 (Fall 2005) 3.92/5
- Math 426 (Spring 2005) 4.13/5

Meetings, Conferences and Workshops

- AMS Fall Southeastern Sectional Meeting
  University of Central Florida, September, 2017.
- Research Roundtable on Global Climate Change Governance: Geoengineering.
  Northwestern University, May, 2017.
- CUR (Council on Undergraduate Research) Dialogues 2017
  Washington, DC, February, 2017.
- 2017 Joint Mathematics Meetings
  Atlanta, January, 2017.

- International Conference on Orthogonal Polynomials and q-Series
  University of Central Florida, May, 2015.
- 152nd Annual Meeting of the National Academy of Sciences (Guest)
  Washington, DC, April, 2015.
- 2015 Joint Mathematics Meetings
  San Antonio, January, 2015.
- Orthogonal Polynomial Day
  University of Central Florida, November 25, 2014.
- AMS Fall Central Sectional Meeting
  University of Wisconsin-Eau Claire, September, 2014.
- AMS Spring Western Sectional Meeting
  University of New Mexico, April, 2014.
- Great Plains Operator Theory Symposium
  Arizona State University, May, 2011.
- Wabash Extramural Modern Analysis Miniconference
  (organized by UIUC, Purdue U, Indiana U and IUPUI), IUPUI, October, 2010.
- International Conference on Operator Algebras and Related Topics
  Academy of Mathematics and System Sciences, Chinese Academy of Sciences, Beijing, China, July, 2010.
- Great Plains Operator Theory Symposium
  University of Denver, June, 2010.
- East Coast Operator Algebras Symposium
  Texas A & M, October, 2009.
- Great Plains Operator Theory Symposium
  University of Colorado Boulder, June, 2009.
- Singer Conference 2009
  "Perspectives in Mathematics and Physics" in celebration of I.M. Singer's 85th birthday and his legendary contributions to mathematics and physics, MIT, May, 2009
- New Hampshire Operator Theory Symposium
  Dartmouth College, May, 2009.
- New Hampshire Operator Theory Symposium
  University of New Hampshire, November, 2008.

- East Coast Operator Algebras Symposium
  Pennsylvania State University, October, 2008.
- "Special Semester with Richard V. Kadison" – Seminar Series on Operator Algebras
  Dept. of Mathematics, Louisiana State University, Spring semester, 2008.
- New Hampshire Operator Theory Symposium
  Dartmouth College, November, 2007.
- East Coast Operator Algebras Symposium
  University of Pennsylvania, October, 2005.
- Great Plains Operator Theory Symposium
  University of Central Florida, June, 2005.
- International Conference on Operator Algebras and Operator Theory
  Shan'xi Normal University, Xi'an, China, July, 2005.

Grants

- Faculty participant, NSF founded MATH-GAINS (Growing as Adaptive Instructors in Gateway to STEM Courses) Project at UCF
  Award: $5,000, 2016-2017.
- Mentor, NSF funded CAMP-YES (Career Advancement Mentoring Program for Young Entrepreneur and Scholars) Program
  Award: $5,000 for mentee per year for two years starting from Fall 2014.
- Mentor, NSF funded EXCEL/COMPASS Program
  Award: $1,000 for each mentee (two) for Spring 2016.
- AWM-NSF Travel Grant, 2014
  Up to $2,000 for domestic travel and of $3,000 for foreign travel.

Service

- **Service to the profession**
  - Reviewer, Mathematical Reviews of the American Mathematical Society (AMS)
  - Referee, Proceedings of the National Academy of Sciences of the United States of America (PNAS)
  - Referee, American Mathematical Monthly of the Mathematical Association of America (MAA)
  - Referee, Science China Mathematics

- Referee, Operators and Matrices
- Referee, Symmetry, Integrability and Geometry: Methods and Applications (SIGMA)
- Referee, Israel Journal of Mathematics
- Referee, Bulletin of the Korean Mathematical Society
- Referee, Demonstratio Mathematica
- Referee, Case Studies in the Environment
- Mentor, National Alliance for Doctoral Studies in the Mathematical Sciences
- Judge, Graduate Student Poster Competition, Association for Women in Mathematics (AWM)
- Judge, Undergraduate Student Poster Competition, MAA

- **Service to the University, College, Department, Community,**

  University:

  - Committee member, Faculty Senate Sub-Committee, Graduate Policy Committee, UCF, Fall 2016
  - Committee member, Undergraduate Common Program Oversight Committee, UCF, Fall 2016
  - Committee member, Interdisciplinary MA/MS Faculty Advisory Committee, Graduate Interdisciplinary Ph.D. Development Sub-Committee, College of Graduate Studies, UCF
  - Graduate Faculty, College of Graduate Studies, UCF
  - Mentor, NSF funded CAMP-YES Program at UCF
  - Mentor, NSF funded EXCEL/COMPASS program at UCF
  - Judge, Graduate Research Forum, Spring 2015, UCF

  College & Department:

  - Committee member, Undergraduate Mentor Committee, 2017-2018
  - Committee member, Math Education Committee, 2017-2018
  - Committee member, Graduate Assessment Committee, 2016-2017
  - Committee member, Math Circles Committee, 2016-2017
  - Committee member, Graduate Teaching Assistant Mentoring Committee, 2016-2017
  - Committee member, Library Committee, 2013-2018
  - Committee member, Faculty Recruitment Committee, 2015-2016
  - Committee member, Math Day Committee, 2015-2016
  - Committee member, Undergraduate Curriculum Committee, 2014-2015

- Committee member, Ph.D. Dissertation Committee
- Committee member, Calculus Textbook Committee
- Committee member, Graduate Preliminary Exam, Dept. of Mathematics, UPenn, 2010–2011
- Volunteer (proctoring and grading), Math Placement Test, Dept. of Mathematics, UNH, 2006-2008

Community and Other:

- Judge, Science Fair Audubon Park Elementary, Orlando May 2015
- Event Assistant, Science Olympiad National Tournament, May 2014
- Assistant, MATHCOUNTS in New Hampshire, 2006–2008

Professional Affiliations

American Mathematical Society

Association for Women in Mathematics

International Association of Mathematical Physics

References

Professor **Richard V. Kadison** (research and teaching)
Gustave C. Kuemmerle Professor of Mathematics, University of Pennsylvania
Member, National Academy of Sciences, U.S.A.
Email: kadison@math.upenn.edu

Professor **Liming Ge** (research and teaching)
Professor of Mathematics, University of New Hampshire
L. K. Hua Research Chair, Academy of Mathematics and Systems Science, Chinese Academy of Sciences
Email: liming@math.unh.edu

Professor **Marc Rieffel** (research)
Professor of Mathematics, University of California, Berkeley
Email: rieffel@math.berkeley.edu

Professor **Judith Packer** (research)
Professor of Mathematics, University of Colorado at Boulder
Email: packer@colorado.edu

Professor **Shôichirô Sakai** (research)
Professor of Mathematics Emeritus, Nihon University, Japan

Professor **Sergio Doplicher** (research)
Professor of Mathematics Emeritus, University of Rome
Email: dopliche@mat.uniroma1.it

Professor **Zhong-Jin Ruan** (research)
Professor of Mathematics, University of Illinois at Urbana-Champaign
Email: ruan@math.uiuc.edu

Professor **Rita Hibschweiler** (teaching)
Professor of Mathematics, University of New Hampshire
Email: rah2@cisunix.unh.edu

Professor **Antonella Grassi** (teaching)
Professor of Mathematics, University of Pennsylvania
Email: grassi@math.upenn.edu