

Chun-Ju Lai

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Academia Sinica

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Research Interests

Affine Hecke algebras, quantum groups, quantum symmetric pairs, highest weight categories, modular representation theory, Springer fibers, quiver varieties, geometric representation theory, and algebraic combinatorics.

Appointments

2016 – 2017	Postdoc Fellow, Max-Planck Institute for Mathematics in Bonn , Germany
2017 – 2020	Limited Term Assistant Professor, University of Georgia Research mentor: Daniel K. Nakano
2020 – now	<i>Assistant Research Fellow</i> , Academia Sinica

Experience

2019	Summer Collaborator Program, Institute for Advanced Study
2021 – now	Program Committee Member, National Center of Theoretical Sciences
2020 – 2023	Member Representative, Mathematical Society of the Republic of China (TMS)
2022	Recipient of the 2021 Young Scientist Award, National Center of Theoretical Sciences

Education

2005 – 2009	B.S. Mathematics; B.S.E. Electrical Engineering, National Taiwan University
2010 – 2011	Research Assistant, National Center of Theoretical Sciences , Taiwan Mentor: Shun-Jen Cheng
2011 – 2016	Ph.D. Mathematics, University of Virginia Advisor: Weiqiang Wang

Publications

- [1] S. Eu, T. Fu, and C. Lai, *On the enumeration of parking functions by leading terms*, Adv. in Appl. Math., 35 (2005), 392–406.
- [2] S. Eu, T. Fu and C. Lai. *Cycle lemma, parking functions and related multigraphs*, Graphs Combin., 26 (2010), 345–360.
- [3] C. Lai, *On Weyl modules over affine Lie algebras in prime characteristic*, Transform. Groups 21 (2016), 1123–1153.
- [4] C. Lai and L. Luo, *An elementary construction of monomial bases of modified quantum affine \mathfrak{gl}_n* , J. Lond. Math. Soc. 96 (2017), 15–27.
- [5] Z. Fan, C. Lai, Y. Li, L. Luo, and W. Wang, *Affine flag varieties and quantum symmetric pairs*, Mem. Amer. Math. Soc., 265 (2020), no. 1285.
- [6] Z. Fan, C. Lai, Y. Li, L. Luo, and W. Wang, *Affine Hecke algebras and quantum symmetric pairs*, Mem. Amer. Math. Soc. , 281(2023) no. 1386.
- [7] Z. Fan, C. Lai, Y. Li, L. Luo, W. Wang and H. Watanabe, *Quantum Schur duality of affine type C with three parameters*, Math. Res. Letters, 27 (2020) 79–114.
- [8] C. Lai and L. Luo, *Schur algebras and quantum symmetric pairs with unequal parameters*, Int. Math. Res. Not., 13 (2021) 10207–10259.
- [9] C. Lai, D. K. Nakano and Z. Xiang, *On Schur algebras corresponding to the Hecke algebras of type B*, Transform. Groups, 27 (2022) 983–1024.
- [10] M.S. Im, C. Lai and A. Wilbert, *A study of irreducible components of Springer fibers using quiver varieties*, J. Algebra, 591 (2022) 217–248.

- [11] M.S. Im, C. Lai and A. Wilbert, *Irreducible components of two-row Springer fibers for all classical types*, Proc. Amer. Math. Soc., 150 (2022), 2415–2432.
- [12] C. Lai, D. K. Nakano and Z. Xiang, *Quantum wreath products and Schur-Weyl duality I*, arXiv:2304.14181, 34 pages.

Grants

- **National Science and Technology Council (NSTC) Grant:**
 - The 2030 Cross-generation Emerging Young Scholars, 111-2628-M-001-007, 112-2628-M-001 -003, 2022–2026.
 - NCTS operational project, co-PI, 112-2124-M-002 -009, 2023–2024.
- **Ministry of Science and Technology (MoST) Grant:**
 - Research Project Grant, 109-2115-M-001-011-MY3, 2020–2023.
 - NCTS operational project, co-PI, 110-2124-M-002-011, 111-2124-M-002-014, 2021–2022.
- **Provost’s Affordable Course Materials Grant**, Center of Teaching and Learning, University of Georgia, with Joseph Hoisington, 2019–2020.
- **ICM 2022 Kovalevskaya Grant** for travel reimbursement.

Training and Service

- **Journal Manuscript Reviewer:** *Communications in Algebra* | *European Journal of Combinatorics* | *Formal Power Series and Algebraic Combinatorics* | *International Mathematics Research Notices* | *Journal of Algebra* | *Journal of Algebra and its Applications* | *Journal of Pure and Applied Algebra* | *Letters in Mathematical Physics* | *Mathematical Research Letters* | *Nagoya Mathematical Journal* | *Pure and Applied Mathematics Quarterly* | *Quarterly Journal of Mathematics* | *Representation Theory* | *Transformation Groups*. I’m also a reviewer for *Zentralblatt MATH (zbMATH)* and *Math Reviews*.
- **Supervising:** Postdoc: You Hung Hsu (AS) | PhD: Ziqing Xiang (current faculty at SUSTech) | RA: Wei-Jiun Kao (current PhD student at U Michigan) | MS: Ming-Jun Lin (NTHU).
- **Science Fair Judge:**
 - of the Georgia Science and Engineering Fair (GSEF), 2018 – 2020. This is a regional competition for researchers in grades 7–12.
 - of the Taiwan International Science Fair 2023. This is the national competition for researchers in grades 7–12.
 - of the Shing-Tung Yau High School Mathematics Award 2020–2021. This is a science fair competition for Taiwanese high school students.
- **Science communicator**
 - for the *Academia Sinica Newsletter*, 2020, regarding representation theory. I’m also serving as an editor of *Academia Sinica Newsletter* 2020–2022.
 - for the *Math Media* Vol. 176, 2020.
 - for the *Taiwan Top Science Student Project*, 2022.

Organizations

1. Conferences:

- **Southeast Lie Theory Conference XI**, University of Georgia, Jun 10–12, 2018.
- **Conference on the Occasion of the Retirement of Yeong-Nan Yeh**, Academia Sinica, Jun 27–28, 2021.
- **AMS Special Session on Representation Theory of Algebraic Groups and Quantum Groups: A Tribute to the Work of Cline, Parshall and Scott (CPS)**, University of Virginia, Mar 11–13, 2022.
- **TMS Annual Meeting**, Academia Sinica, Jan 17–18, 2022.
- **AMS Special Sessions** at the University of Virginia, Mar 11–13, 2022; and at the Georgia Tech, Mar 17–18, 2023.
- **Conference on Algebraic Representation Theory (CART)**, NCTS, Taiwan, Dec 1–3, 2023.

2. Seminars:

- **Algebra Seminar at the University of Georgia**, Aug 2018 – May 2020.
- **Colloquium at the Academia Sinica**, 2020 - now.

- **Basic Notion Seminar**, Academia Sinica/National Taiwan University, 2020 - now.
- **Learning Seminar on Representation Theory**, Academia Sinica, 2020 - now.
 - 2020 Fall: on Soergel bimodules
 - 2021 Spring: on Kac-Moody groups
 - 2021 Fall: on Geometric representation theory
 - 2022 Spring: on Double Affine Hecke Algebras
 - 2023 Spring: on Integral Hecke Algebras
 - 2023 Fall: on R -matrices

Conference Talks

2007	Jun	Cross-strait Conference on Graph Theory and Combinatorics, National Taiwan University, Taiwan
2014	May	Southeastern Lie Theory Workshop, University of Georgia, USA
2015	Mar	AMS special session on <i>Quantum Algebras, Representations, and Categorifications</i> , Georgetown University, USA
	Jul	Workshop on Lie Theory and Representation Theory, East China Normal University, China
	Oct	Southeastern Lie Theory Workshop, North Carolina State University, USA
2016	May	Workshop on Hecke Algebras and Lie Theory, University of Ottawa, Canada
	May	Southeastern Lie Theory Workshop, University of Virginia, USA
2017	Jul	Taipei Workshop on Representation Theory of Lie Superalgebras and Related Topics, Academia Sinica, Taiwan
	Sep	AMS special session on <i>Recent Advancements in Representation Theory</i> , University at Buffalo (SUNY), USA
2018	Oct	Representation Theory, Combinatorics, and Geometry, University of Virginia, USA
2019	Mar	AMS special session on <i>Representations of Lie algebras, algebraic groups, and quantum groups</i> , Auburn University, USA
	May	Southeastern Lie Theory Workshop, Louisiana State University
	Nov	AMS special session on <i>Geometric Methods in Representation Theory</i> , University of California Riverside, USA
	Nov	AMS special session on <i>Geometry and Representation Theory of Quantum Algebras and Related Topics</i> , University of California Riverside, USA
2020	Aug	Taipei workshop on representation theory and related topics, Academia Sinica, Taiwan
	Oct	AMS special session on Geometry and Representation Theory of Quantum Algebras and Related Topics, University of Utah, USA
	Dec	TMS Annual Meeting, Fu-Jen Catholic University, Taiwan
2021	Nov	Conference on Algebraic Representation Theory (CART), Seoul National University, Korea
2022	Nov	Two-day Workshop on Lie Theory, Fudan University, China
2023	Jan	TMS Annual Meeting, National Tsing Hua University, Taiwan
	Jun	Representation Theory of Hecke Algebras and Categorification, OIST, Japan
	Aug	International Algebra Conference in the Philippines (IACP), Philippines
2024	Jan	TMS Annual Meeting, National Cheng Chi University, Taiwan
	Mar	One Day Workshop in Lie Theory, Beijing Institute of Technology, Beijing, China.
	May	AMS special session on Diagrammatic Algebras in Representation Theory and Beyond, San Francisco State University, USA
	May	Representation Theory and Related Geometry: Progress and Prospects, University of Georgia, USA
	Aug	Lie Theory and Related Topics, Sichuan University, Chengdu, China.

Expository Talks

2014	Jul	5 lectures, <i>Minicourse on Representation Theory of Lie Algebras</i> , Taiwan Normal University, Taiwan
	Dec	4 lectures, <i>Minicourse on Representation Theory of Lie Algebras</i> , Central University, Taiwan
2016	Jul	3 lectures, <i>Minicourse on Quantum Groups</i> , Taiwan Normal University, Taiwan
2020	Oct	10 lectures, <i>Minicourse on Springer Fibers and Quiver Varieties</i> , National Center of Theoretical Science, Taiwan
2023	Aug	2 lectures, <i>Minicourse on Quantum Wreath Products</i> , National Center of Theoretical Science, Taiwan

Seminar Talks

2010	Nov	Combinatorics Seminar, University of Kaohsiung, Taiwan
2013	Sep	Algebra seminar, University of Virginia, USA
	Nov	Graduate seminar, University of Virginia, USA
2014	May	Algebra seminar, University of Virginia, USA
	Dec	Seminar, Central University, Taiwan
	Dec	Seminar, Academia Sinica, Taiwan
2015	Nov	Algebra seminar, University of Virginia, USA
	Dec	Lie Group/Representation Theory Seminar, University of Maryland, USA
2016	Sep	Algebra Seminar, University at Buffalo (SUNY), USA
	Oct	Emmy Noether Seminar, FAU Erlangen-Nürnberg, Germany
	Nov	Algebra Seminar, Newcastle University, UK
	Dec	Oberseminar, Max Planck Institute for Mathematics in Bonn, Germany
	Dec	Algebra Seminar, Universität Bonn, Germany
	Dec	Algebra Seminar, Institut de mathématiques de Jussieu-Paris Rive Gauche, France
2017	Feb	Algebra Seminar, Université Clermont Auvergne, France
	Apr	Algebra Seminar, Universität Bielefeld, Germany
	Aug	Algebra Seminar, University of Georgia, USA
	Aug	Oberseminar, University of Georgia, USA
	Sep	Algebra Seminar, University of Georgia, USA
2018	Apr	Algebra Seminar, University of Georgia, USA
	Sep	Algebra Seminar, University of Georgia, USA
	Dec	Combinatorics Seminar, Academia Sinica, Taiwan
2019	Jan	Algebra Seminar, University of Georgia, USA
	Sep	Algebra Seminar, University of Georgia, USA
	Dec	Combinatorics Seminar, Sun Yat-Sen University, Taiwan
	Dec	Combinatorics Seminar, Academia Sinica, Taiwan
	Dec	Colloquium, Tsing Hua University, Taiwan
2020	Feb	Algebra Seminar, Taiwan University, Taiwan
	Oct	Minicourse on representation theory, National Center of Theoretical Sciences, Taiwan
	Nov	Basic Notions Seminar, Taiwan University, Taiwan
	Nov	Algebra Seminar, Jagiellonian University, Poland
	Dec	Algebra Seminar, Cheng Kung University, Taiwan
2021	Jan	Colloquium, Central University, Taiwan
	May	Colloquium, Tsing Hua University, Taiwan
	Sep	QSMS Seminar, Center for Quantum Structures in Modules and Spaces, Korea
	Oct	Colloquium, Chengchi University, Taiwan
2022	Mar	Algebra Seminar, Cheng Kung University, Taiwan
	Feb	Colloquium, Taiwan University, Taiwan
	Mar	Algebra Seminar, University of Georgia, USA
	Mar	Algebra Seminar, University of Virginia, USA
	Mar	Awardee Lecture, NCTS Spring Day, NCTS, Taiwan
	Sep	Algebra Seminar, Uppsala University, Sweden
	Oct	"What are you thinking about?" Seminar, University of Amsterdam, Netherlands

	Oct	Algebra Seminar, University of Cologne, Germany
	Nov	Representation Theory Seminar, OIST, Japan
2023	Mar	TACO Seminar, Loyola University Chicago, USA
	Mar	Algebra Seminar, California State University Northridge, USA
	Mar	Algebra Seminar, University of Virginia, USA
	Mar	Algebra Seminar, University of Georgia, USA
	Oct	Colloquium, Central University, Taiwan
	Nov	Algebra Seminar, SUSTech, China
2024	Apr	Student Geometry Seminar, Tsing Hua University, Taiwan
	Apr	Algebra Seminar, University of Oregon, USA
	Jun	Algebra Seminar, Universität Bonn, Germany