

# Ma, Jia-Jun

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## Current Position

- Jul 2021-present Associate Professor,  
School of Mathematical Science, Xiamen University, China
- Sep 2021-present Associate Professor,  
School of Mathematical Science, Xiamen University Malaysia, Malaysia

## Research Interests

- Pure Math. Representation Theory of reductive groups,  
Hecke algebra and Geometric representation theory,  
Theta Correspondence and local Langlands program
- AI4Math Formalization of Game Theory in Lean  
Interactive and Automated Theorem Proving  
Integrating AI and Lean in Teaching

## Education

- Feb, 2013 **Ph.D in Mathematics**, *National University of Singapore*, Singapore  
Dissertation: *Two topics on local theta correspondence*  
Advisors: Professor Chen-Bo Zhu
- Jun, 2007 **B.S. in Mathematics**, *Soochow University*, Suzhou, Jiangsu, China

## Career

- Jul 2021-present Associate Professor,  
School of Mathematical Science, Xiamen University, China
- Sep 2021-present Associate Professor,  
Department of Mathematics, Xiamen University Malaysia, Malaysia
- Jan 2017-Jun 2021 Associate Professor,  
School of Mathematical Science, Shanghai Jiao Tong University, China
- Mar 2016-Dec 2016 Research Fellow, Department of Mathematics, National University of Singapore, Singapore
- Sept 2014-Feb 2016 Postdoctoral Fellow, The Institute of Mathematical Sciences,  
The Chinese University of Hong Kong, Hong Kong
- Oct 2013-Aug 2014 Postdoctoral Fellow, Department of Mathematics, Ben-Gurion University of the Negav, Israel
- Apr 2013-Aug 2013 Research Fellow, Department of Mathematics, National University of Singapore, Singapore

## Teaching

- 2023-2024 MA505: Algebraic Topology\*, Xiamen University Malaysia  
Fall
- 2021-2024 MA401: Research Methodology\*, Xiamen University Malaysia  
Fall

2021-2024 MA205: Abstract Algebra II, Xiamen University Malaysia  
Spring

2022-2022 MA211: Abstract Algebra I, Xiamen University Malaysia  
Fall

2019 Fall MA270: Linear Algebra, Shanghai Jiao Tong University

2019 Fall MA603: Representation theory\*, Shanghai Jiao Tong University

2018-2019 MA333: Algebraic Topology, Shanghai Jiao Tong University  
Spring

2018-2020 MA093: College Mathematics, Shanghai Jiao Tong University  
Spring

2017 Fall MA417: Algebraic Number Theory, Shanghai Jiao Tong University

2017-2021 MA135: Advanced Algebra and Analytic Geometry II, Shanghai Jiao Tong University  
Spring

2016 Fall MA6291: Topics In Mathematics I\*, National University of Singapore  
Character theory of representations of reductive groups over local fields

2015 Summer MA1030E: Linear Algebra I, CUHK

2014 Fall Geometric Representation theory, 5-lectures, BGU

Courses marked with an asterisk “\*” are for graduate students.

## Publications

- [1] Special unipotent representations of real classical groups: counting and reduction to good parity (with Dan Barabasch, Binyong Sun and Chen-Bo Zhu), ArXiv e-prints: 2205.05266, to appear Journal of the European Mathematical Society
- [2] Associated varieties of minimal highest weight modules (with Zhanqiang Bai, Wei Xiao, and Xun Xie), ArXiv e-prints: 1909.00914, 2024, to appear Representation Theory
- [3] Generic Hecke algebra and theta correspondence over finite fields (with Congling Qiu, Jialiang Zou), Advances in Mathematics, Volume 438, February 2024
- [4] Fourier-Jacobi models of Deligne-Lusztig characters and depth zero local descent for unitary groups (with Dongwen Liu and Fang Shi), ArXiv e-prints: 2208.02308, to appear in Israel J. Math.
- [5] Special unipotent representations of simple linear Lie groups of type A (with Dan Barabasch, Binyong Sun and Chen-Bo Zhu), Acta. Math. Sin.-English Ser. 40, 707–716 (2024).
- [6] Genuine special unipotent representations of real and quaternionic spin groups (with Dan Barabasch, Binyong Sun and Chen-Bo Zhu), ArXiv e-prints: 2303.03571, to appear in Progr. Math., Festschrift in honor of Toshiyuki Kobayashi.
- [7] On the Notion of Metaplectic Barbasch–Vogan Duality, (with Dan Barabasch, Binyong Sun and Chen-Bo Zhu), International Mathematics Research Notices, Volume 2023, Issue 20, October 2023, Pages 17822–17852
- [8] Nilpotent orbits of orthogonal groups over p-adic fields, and the DeBacker parametrization (with Tobias Bernstein, Monica Nevins, Jit Wu Yap), Algebras and Representation, Volume 23, pages 2033–2058, (2020)
- [9] On two questions concerning representations distinguished by the Galois involution (with Maxim Gurevich and Arnab Mitra), ArXiv e-prints: 1609.03155, Forum Mathematicum, Volume 30, Issue 1, pp 141–157, 2018
- [10] Local theta correspondence between supercuspidal representations, (with Hung Yean Loke), ArXiv e-prints: 1512.01797, Annales Scientifiques de l’ENS, Vol 51, Issue 4, pp 927–991, 2018
- [11] Local theta correspondences between epipelagic supercuspidal representations, (with Hung Yean Loke and Gordan Savin), ArXiv e-prints: 1501.07069, Mathematische Zeitschrift, Vol 283, Issue 1, pp 169–196, 2016

- [12] Invariants and  $K$ -spectrums of local theta lifts,  
(with Hung Yean Loke), *Compositio Mathematica*, Vol 151, Issue 01, pp 179-206, 2015
- [13] Derived functor modules, dual pairs and  $U(\mathfrak{g})^K$ -actions, ArXiv e-prints: 1310.6378,  
*Journal of Algebra*, Vol 450, pp 629-645, 2016
- [14] Transfers of  $K$ -types on local theta lifts of characters and unitary lowest weight modules,  
(with Hung Yean Loke and U-Liang Tang),  
*Israel Journal of Mathematics*, Vol 201, Issue 1, pp 1-24, 2014

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## Preprints

- [1] A combinatorial characterization of the annihilator varieties of highest weight modules for classical Lie algebras (with Zhanqiang Bai, and Yutong Wang), ArXiv e-prints: 2304.03475, 2023
- [2] Special unipotent representations of real classical groups: construction and unitarity (with Dan Barabasch, Binyong Sun and Chen-Bo Zhu), ArXiv e-prints: 1712.05552, submitted, 2023  
The python code of the algorithm in the paper can be found at  
<https://github.com/jiajunma/unipotentrepn>

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## Funding (as Principal investigator)

- 2023-2025 Fundamental Research Funds for the Central Universities
- 2022-2024 Xiamen University Malaysia Research Fund
- 2018-2020 National Natural Science Foundation of China for Young Scientists

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## Selected Talks

- Sep 2, 2024 An Adventure in Formalization: From the Game Theory to Algebraic Structures  
AI for Mathematics Workshop on Lean, Automated Reasoning and Beyond, Beijing International Center for Mathematical Research
- Jun 28, 2024 Theta correspondence and its Geometrization  
Hong Kong University Number Theory Days
- Nov 10, 2023 The weak Arthur packet of real classical groups  
BIRS Workshop: Arthur packets, Institute for Advanced Study in Mathematics (IASM), Hnagzhou, China
- May 27, 2023 Lean and a Formalization Coxeter groups,  
Shanghai Jiao Tong Univeristy, Shanghai, China
- July 14, 2022 Generic Hecke algebra and theta correspondence over finite fields  
A satellite conference of the virtual ICM 2022: Representations and Characters: Revisiting the Works of Harish-Chandra and André Weil, IMS, NUS, Singapore
- Apr 14, 2022 Generic Hecke algebra and theta correspondence over finite fields  
Minimal Representations and Theta Correspondence, The Erwin Schrödinger International Institute for Mathematics and Physics (ESI), online
- Dec 25, 2020 Towards the explicit description of local descent of symplectic supercuspidal representations of  $GL_{2n}$   
Yau Mathematical Sciences Center, Beijing
- Sep 2, 2020 Special unipotent representations of real classical groups and theta correspondence  
Associated Varieties and Unipotent Representations,  
Beijing International Center for Mathematical Research, Online
- Sep 29, 2019 Types and Local theta correspondence between supercuspidal representations  
Sep 29, 2019, New Developments in Representation Theory of  $p$ -adic, Oberwolfach, Germany
- Dec 14, 2018 On theta correspondence over finite fields  
Dec 14, 2018, The Institute of Mathematical Sciences, The Chinese University of Hong Kong, Hong Kong

- Jun 12, 2018 On unipotent representations of real classical groups  
AMS-CMS International Meeting in Shanghai, Shanghai
- Jul 19, 2017 Types and Local theta correspondence between supercuspidal representations  
Representation theory of  $p$ -adic groups, IISER Pune, India
- Aug 10, 2016 Theta correspondence and Moment maps  
The 7th International Congress of Chinese Mathematicians, Beijing
- Dec 25, 2015 Local theta correspondence between supercuspidal representations,  
Kyoto University
- Sep 05, 2014 Local theta correspondence between supercuspidal representations,  
The Institute of Mathematical Sciences, The Chinese University of Hong Kong, Hongkong
- Jul 23, 2014 Theta correspondence between supercuspidal representations,  
Workshop on Representation Theory, National University of Singapore, Singapore
- May 28, 2014 Explicit local theta correspondences between (epipelagic) supercuspidal representations,  
Algebraic Geometry and Number Theory Seminar, Ben Gurion University, Israel
- Feb 26, 2014 Associated varieties and associated cycles of local theta lifts,  
Faculty of Mathematics and Computer Science, The Weizmann Institute of Science, Israel
- Dec 05, 2012 Theta lifts of one-dimensional representations,  
Symposium on Representation Theory 2012, Kagoshima, Japan
- Mar 15, 2012 Derived functor modules, dual pairs and  $U(\mathfrak{g})^K$ -actions,  
Branching Laws, Institute for Mathematical Sciences, National University of Singapore, Singapore
- Jan 28, 2011 Dual pairs and  $U(\mathfrak{g})^K$ -actions,  
Workshop on Geometry and Representation Theory, Institute for Mathematical Sciences, National University of Singapore, Singapore

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## Conferences Organized

- Jul 21-28, 2024 Real Reductive Groups and Theta Correspondence, Tianyuan Mathematics Research Center, China
- Apr 15-26, 2024 Workshop on Formal Proofs and Lean, Institute for Mathematical Sciences, NUS, Singapore
- Jun 18-21, 2021 Workshop on Representation Theory and Langlands Program, Shanghai Jiaotong University, Shanghai, China

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## Personal Information

Date of Birth	Jan 14, 1985	Place of Birth	Suzhou, Jiangsu (China)
Citizenship	China, Singapore Permanent Resident	Gender	Male
Language	Chinese (native), English (fluent), French (basic)	Marital status	Married