

# Chenwei Ruan

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## Professional experience

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- **Chern Instructor**, Beijing Institute of Mathematical Sciences and Applications, Beijing, China, July 2024 – now  
Mentors: Bart Vlaar, Sergey Oblezin, Yu Qiu

## Education

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- **Ph.D. in Mathematics**, University of Wisconsin-Madison, Madison, United States, May 2024  
Advisor: Paul Terwilliger
- **M.S. in Mathematics**, University of Wisconsin-Madison, Madison, United States, May 2018
- **B.S. in Mathematics**, Nanjing University, Nanjing, China, March 2017

## Research Interests

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- Algebraic combinatorics: distance-regular graphs, Terwilliger algebra, tridiagonal pairs, association schemes;
- Representation theory: quantum algebra, Askey-Wilson algebra, tridiagonal algebra, Lie algebra;
- Mathematical physics: integrable systems.

## Publications

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### Refereed Journal Articles

- **C. Ruan**, Doubly alternating words in the positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$ , *J. Algebra* 664A (2025) 288-311, [arXiv:2408.02633](#).
- **C. Ruan**, A generating function associated with the alternating elements in the positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$ , *Commun. Algebra* 51 (2023) 1707-1720, [arXiv:2204.10223](#).

### Accepted Journal Articles

- **C. Ruan**, A uniform approach to the Damiani, Beck, and alternating PBW bases for the positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$ , accepted by *J. Algebra Appl.*, [arXiv:2305.11152](#).

## Invited Conference Presentations

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- *A uniform approach to the Damiani, Beck, and alternating PBW bases for the positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$  (25 minutes)*, the 10th Slovenian Conference on Graph Theory, Minisymposium: Association Schemes and Related Algebras, Kranjska Gora, Slovenia, June 18–24, 2023

- *A generating function associated with the alternating elements in the positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$  (45 minutes)*, the CRM workshop on Graph Theory, Algebraic Combinatorics and Mathematical Physics, Centre de Recherches Mathématiques, Montreal, Canada, July 25–August 19, 2022 (Online)
- *A generating function associated with the alternating elements in the positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$  (30 minutes)*, the 16th International Symposium on Orthogonal Polynomials, Special Functions and Applications, Minisymposium: PhD and postdoctoral fellows, Centre de Recherches Mathématiques, Montreal, Canada, June 13–17, 2022 (Online)

## Seminar Talks

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- *The positive part of  $U_q(\widehat{\mathfrak{sl}}_2)$  and its embedding into a  $q$ -shuffle algebra (90 minutes)*, BIMSA Integrable Systems Seminar, Beijing Institute of Mathematical Sciences and Applications, Beijing, China, Oct 18, 2024
- *A uniform approach to the Damiani, Beck, and alternating PBW bases for  $U_q^+$  (60 minutes)*, BIMSA Integrable Systems Seminar, Beijing Institute of Mathematical Sciences and Applications, Beijing, China, Dec 22, 2023
- *Distance-regular graphs and the positive part  $U_q^+$  of the  $q$ -deformed enveloping algebra for affine  $\mathfrak{sl}_2$  (60 minutes)*, Tohoku University Combinatorics Seminar, Tohoku University, Sendai, Japan, Dec 12, 2023 (Online)
- *Distance-regular graphs and the positive part  $U_q^+$  of the  $q$ -deformed enveloping algebra for affine  $\mathfrak{sl}_2$  (60 minutes)*, Wu Wen-Tsun Key Laboratory of Mathematics Combinatorics Seminar, University of Science and Technology of China, Hefei, China, Sep 27, 2023
- *A uniform approach to the Damiani, Beck, and alternating PBW bases for  $U_q^+$  (50 minutes)*, UW-Madison Combinatorics Seminar, University of Wisconsin-Madison, Madison, United States, Dec 5, 2022 (Online)
- *Some elements in the quantum affine  $\mathfrak{sl}_2$  algebra (50 minutes)*, UW-Madison Combinatorics Seminar, University of Wisconsin-Madison, Madison, United States, Feb 7, 2022 (Online)

## Courses Taught

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- **Beijing Institute of Mathematical Sciences and Applications**

*Lecturer*

- Introduction to Lie algebras Spring 2025

- **University of Wisconsin-Madison**

*Teaching Assistant*

- Math 221: Calculus and Analytic Geometry 1 Fall 2018, Fall 2021
- Math 320: Linear Algebra and Differential Equations Summer 2021
- Math 112: Algebra Spring 2021
- Math 211: Calculus Spring 2020, Fall 2020
- Math 213: Calculus and Introduction to Differential Equations Fall 2019
- Math 240: Introduction to Discrete Mathematics Spring 2019

*Grader*

- Math 475: Introduction to Combinatorics

Summer 2021

**Mathematical Outreach**

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- **Directed Reading Program**, University of Wisconsin-Madison, Madison, United States

The Directed Reading Program pairs undergraduate students with graduate mentors for semester-long independent studies. During the semester, I mentored a group of students who worked through a mathematical textbook. I held weekly discussions with the students. I also helped the students in preparing their presentations at the end of the semester.

- *Combinatorics Through Guided Discovery*, by Kenneth Bogart Spring 2018
- *Elements of Set Theory*, by Herbert Enderton Fall 2017
- *Abstract and Concrete Categories: The Joy of Cats*, by Jiri Adámek, Horst Herrlich, George Strecker Spring 2017

- **Mega Math Meet**, University of Wisconsin-Madison, Madison, United States

The Math Meet is a mathematical competition for local students in fifth and sixth grades. The students form teams and compete at a regional meets. The first and second place teams qualify for a grand final called the Mega Math Meet, held at UW-Madison. I joined the group in writing the exam for Mega Math Meet in 2017 and was in charge of making one of the five problems.