

# Xiaolong Pan

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## Education

- Bachelor of Sciences, 09/2018-06/2023  
Huazhong University of Science and Technology, China
- Master in pure mathematics, 09/2023-06/2025, Advisor: Professor Ming Lu  
Sichuan University, China
- PhD in pure mathematics, 09/2025-now, Advisor: Professor Ming Lu  
Sichuan University, China

## Research Interests

- Geometric representation theory, focusing on quantum groups, Hall algebras, and quiver varieties
- quiver Hecke algebras and the diagrammatic approach developed by Khovanov and Lauda, also their applications in categorification

## Languages

- Chinese, English

## Publications and preprints

- (with Ming Lu) *Dual canonical bases of quantum groups and  $\imath$ quantum groups*, arXiv:2504.19073.  
This paper discusses the two realizations of  $\imath$ quantum groups via  $\imath$ Hall algebras and dual quantum Grothendieck rings of quiver varieties. Perverse sheaves provide the dual canonical bases for  $\imath$ quantum groups of type ADE with integral and positive structure constants. A new construction of the dual canonical bases of  $\imath$ quantum groups in the setting of  $\imath$ Hall algebras is presented, through which one can deduce the invariance of dual canonical bases under braid group actions and Fourier transformations. It is also proved that the dual canonical basis of quantum groups coincides with the double canonical basis defined by Berenstein and Greenstein.
- (with Jiayi Chen, Ming Lu, Shiquan Ruan, and Weiqiang Wang)  *$\imath$ Quantum groups and  $\imath$ Hopf algebras I: foundation*, submitted.  
The notion of  $\imath$ Hopf algebra, a new associative algebra structure defined on a Hopf algebra equipped with a Hopf pairing, is introduced in this paper. The  $\imath$ Hopf algebra on a Borel quantum group endowed with a  $\tau$ -twisted Hopf pairing is shown to be a quasi-split universal  $\imath$ quantum group. In particular, the Drinfeld double quantum group is realized as the  $\imath$ Hopf algebra on the double Borel. This  $\imath$ Hopf approach allows us to develop connections between Lusztig's braid group action and relative braid group action.

- (with Jiayi Chen, Ming Lu, Shiquan Ruan, and Weiqiang Wang)  *$\iota$ Quantum groups and  $\iota$ Hopf algebras II: dual canonical bases*, preparing.

The iHopf framework enables us to construct the dual canonical basis of a universal iquantum group of arbitrary finite type, which are shown to be preserved by the ibraid group action. Again, the dual canonical basis for the Drinfeld double quantum group constructed via iHopf algebra on the double Borel is identified with Berenstein-Greenstein's double canonical basis.

## Participation in conferences

- Conference on Representation Theory, Geometry and Categorification, June 2024, Beijing Institute of Technology, Beijing, China
- International Conference on Representations of Algebras (ICRA 21, 2024), August 2024, Shanghai Jiao Tong University, Shanghai, China
- The International Conference on Representation Theory, June 2025, Nanjing University, Nanjing, China