

(For the application of PhD program in the math department at the University of Padova)

# RUNLEI XIAO

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## EDUCATION

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<b>Université de Bourgogne</b>   Dijon, France	2022-2023
• Mathematical Physics (M2), Master's Degree Candidate ( <b>Thesis Defense Passed</b> )	
<b>Sorbonne Université</b>   Paris, France	2021-2022
• Fundamental Mathematics (M2), Master's Degree Candidate	
<b>Université de Nice</b>   Nice, France	2020-2021
• Pure and Applied Mathematics, Geometry and Algebra (M2), Master's Degree	
<b>Capital Normal University</b>   Beijing, China	2016-2020
• Pure and Applied Mathematics, Bachelor's Degree	

## RESEARCH INTERESTS

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### The Langlands Program

- Langlands functoriality | Compactification of moduli space | Moduli space of Higgs bundle and local system

### Motivic Homotopy Theory and K-theory

- $\mathbb{P}^1$ -invertible motivic homotopy theory | Hermitian  $K$ -theory of stable  $\infty$ -category | Derived algebraic geometry

### Homotopy Theory

- $\infty$ -category theory | Stratified homotopy theory

## RESEARCH EXPERIENCE AND THESIS

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### Excision and Cdh-descent for Hermitian K-theory

Visiting position, Summer 2023

- Leading by Dr. Vova Sosnilo at the University of Regensburg
- Trying to reconstruct  $\odot$  product in Poincare  $\infty$ -category which is constructed by Markus Land and Georg Tamme before in algebraic  $K$ -theory of  $\mathcal{E}_1$ -ring spectrum.

### Euler Classes in Motivic Homotopy Theory

Master thesis, 2023

- Supervised by Adrien Dubouloz and Daniele Faenzi at the Université de Bourgogne
- Studied six-functor formalism on motivic homotopy category
- Comparing Euler classes defined by zero section and transversal section using 6-functor formalism in motivic homotopy theory.
- Studied naïve  $A^1$ -homotopy to approach  $A^1$ -homotopy theory,

### Orbifolds Structure of the Moduli Space of Metric Ribbon Graphs

Master thesis, 2021

- Supervised by Clemens Berger at the Université de Nice
- Studied ribbon graphs (combinatorial objects representing graphs embedded in a closed oriented topological surface)
- Constructed the category of ribbon graphs and build a geometrization functor to differential manifold
- Established the structure of differential orbifold of the moduli space of metric ribbon graphs with fixed topological type

### Introduction to Infinity Category

Bachelor Thesis, 2020

- Supervised by Jilong Tong, at the Capital Normal University
- Studied the model category theory, and the Joyal/ Lurie model of infinity category
- Studied the proof of the category of functors between infinity categories

## KNOWLEDGE BACKGROUND

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### The Langlands Program (Geometric Representation Theory and Moduli Problem)

- Algebraic stack | Infinity category | Higgs bundle and local system
- Arithmetic aspect of character variety | Combinatorial description of moduli space of Riemann surface

## Motive Theory

- Motivic cohomology | Motivic homotopy theory | Hermitian K-theory | Algebraic K-theory

## SUMMER SCHOOLS, CONFERENCES AND LEARNING GROUPS

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### The Langland's Program and Related Topics

- (CATS7) Categories and Stacks in Algebraic Geometry and Algebraic Topology | October 2023
- (Learning Group) Compactification of Locally Symmetric Space (**Talk given on polyhedral reduction theory in self-adjoint cones**) | October 2022
- (Learning Group) P-adic Langlands Program (**Talk given on Witt vector**) | November 2021
- (CATS60) Carlos Simpson's Birthday Conference | June 2022

### Motives and Homotopy Theory

- (BIMSA Summer School) Chow-Witt Rings: Computations and Applications | August 2023
- (Conference) Motives in Moduli and Representation Theory | July 2023
- (Conference) Motivic and Non-commutative Aspects of Enumerative Geometry | July 2023
- (Seminar) Chromatic Homotopy Theory (**Talk given on Morava stabilizer groups and Lubin-Tate theory**) | June 2023
- (Conference) Homotopy Theory, K-theory and Trace Methods | July 2023
- (Conference) Motives, Quadratic Forms and Arithmetic Conference | October 2022
- (Conference) Unifying Themes in Geometry, Higher Homotopical Structure | September 2021
- (Seminar) Stratified Homotopy Theory | October 2020

### Higher Category Theory/ Category Theory

- (Seminar in Regensburg) Topics on  $(\infty, 2)$ -categories | May 2023
- (Learning Group) Infinity Category (**Talk given on introduction to infinity category**) | October 2022

## LANGUAGES

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Chinese (native) | English (fluent, B2) | French (fluent, B2)

## REFEREE

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Adrien Dobouloz | Chargé de Recherches, Université de Bourgogne

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Carlos Simpson | Directeur de recherche

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Vova Sosnilo | Research assistant, University of Regensburg

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