

# Yuanzheng Wang

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## Education

Peking University

*B.S. Mathematics*

Sep. 2020 – June 2024 (expected)

*Beijing, China*

GPA: 3.95/4.00, Major GPA: 3.95/4.00, Rank: 1/236.

## Research Interests

Probability Theory and its intersection with Statistical Physics, Combinatorics and Geometry.

## Articles

### Research Works

1. **Efficiently matching random inhomogeneous graphs via degree profiles** (with Jian Ding and Yumou Fei), *submitted to Annals of Statistics*, arxiv:2310.10441, 2023.
2. **Disconnection time of a discrete cylinder by a biased random walk** (with Xinyi Li and Yu Liu), *in preparation*, 2023.

### Expository Works

1. **Notes on conformal welding of Liouville quantum gravity surfaces**, REU paper, advised by Ewain Gwynne, 2023. Link available [here](#).

## Research Experiences

### Random Walks and Random Interlacements

March 2022 – Present

*Advised by Prof. Xinyi Li and working with Ms. Yu Liu*

*Peking University, China*

- Studied the following interesting problem: what is the asymptotics of the disconnection time of a discrete cylinder  $(\mathbb{Z}/N\mathbb{Z})^d \times \mathbb{Z}$  ( $d \geq 2$ ) by a random walk or a biased random walk (with bias in the  $\mathbb{Z}$  direction)?
- Improved previous results in the unbiased case and the biased case with bias smaller than  $N^{-1}$
- Carried out the whole outline and main technical analysis of our proof, integrating a number of ideas and techniques about random interlacements
- Learned various properties and techniques about random walks and random interlacements

### Random Graph Matching

May 2023 – Oct. 2022

*Advised by Prof. Jian Ding and working with Mr. Yumou Fei*

*Peking University, China*

- Studied and accomplished a preprint on the matching recovery of correlated inhomogeneous random graphs
- Adapted the degree-profile algorithm in the paper “Efficient random graph matching via degree profiles” by Ding, Ma, Wu and Xu, and hugely relaxed the model assumptions in the correlated Erdos-Renyi graph model
- Devised the idea of choosing unions of intervals as bins, enabling us to bypass certain technical difficulties.

### Planar Random Geometry (at Uchicago Math REU 2023)

June. 2023 – Aug. 2023

*Advised by Prof. Ewain Gwynne*

*University of Chicago, United States*

- Accomplished notes on Sheffield’s conformal welding theory
- Learned various mating-of-trees bijections with respect to Fortuin-Kasteleyn random planar maps, bipolar orientations, Schnyder woods, etc.
- Learned properties and techniques about continuum models including GFF, LQG and SLE
- Learned the first eight sections of the fundamental paper “Liouville quantum gravity as a mating of trees” by Duplantier, Miller and Sheffield

### Approximate Counting and Spectral Independence

Jan. 2023 – April 2023

*Advised by Prof. Jian Ding and working with Mr. Yumou Fei*

*Peking University, China*

- Studied the problem of approximately counting  $b$ -matchings in a finite graph
- Came up with the idea of using log-concavity as a characterization, and proved new log-concavity results related with the problem
- Learned various properties and techniques about spectral independence, a recent significant development on high-dimensional walks

## Honors and Awards

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- National Scholarship (the highest honor for college students in China) 2023
  - Merit Student of Peking University 2023
  - Silver Medal, S.T. Yau College Student Mathematics Contest, Probability and Statistics Track 2023
  - Silver Medal, S.T. Yau College Student Mathematics Contest, Team Awards 2023
  - First Prize, National College Student Mathematics Contest 2023
  - Three scholarships awarded to top 5% students in School of Mathematical Sciences 2021-2022
  - Gold Medal in China Mathematical Olympiad 2019

## Talks and Seminars

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**Academy of Mathematics and System Sciences, CAS Colloquia & Seminars** Nov. 2022  
*Organized by Prof. Xinyi Li and Prof. Quan Shi* Online

- Gave a talk on the existence of phase transition of Bernoulli percolation using the Gaussian Free Field, based on the paper of Duminil-Copin, Goswami, Raoufi, Severo and Yadin

**Other Student Seminars** 2022-2023

*Organized by Prof. Jian Ding and students of Peking University* Peking University, China

- Gave several talks on Bernoulli percolation, Brownian motion, random walk, spectral independence and random interlacements, see [my homepage](#) for details.

## Selected Scores

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Probability Courses	Grades	Other Major Courses	Grades
Probability Theory	98	Advance Algebra I, II	97, 99.5
Mathematical Statistics	98	Geometry	98
Measure Theory	100	Functions of Real Variables	99
Applied Stochastic Process (Honor)	98	Abstract Algebra	98
Theory of Advanced Probability (Graduate)	97	Partial Differential Equations	97
Stochastic Processes (Graduate)	95	Topology	96

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## Standardized Language Tests

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- TOEFL iBT, Total 107 (Reading 29, Listening 28, Speaking 24, Writing 26)
  - GRE General Test, Total 328+4.0 (Verbal Reasoning 159, Quantitative Reasoning 169, Analytical Writing 4.0)
  - GRE Subject Test in Mathematics, 970