Yuanzheng Wang

School of Mathematical Sciences, Peking University
Personal homepage: https://yuanzheng-wang.github.io/ Email: arenwyz@stu.pku.edu.cn

Education

Peking University **Sep. 2020 – July 2024 (expected)**
B.S. Mathematics *Beijing, China*

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

Research Interests

Probability Theory and its intersections with Statistical Physics, Analysis and Combinatorics.

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. Link available here.
2. **Sharp asymptotics of disconnection time of a cylinder by simple and 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, mentored by Ewain Gwynne, 2023. Link available here.

Research Experiences

Random Walks and Random Interlacements **March 2023 – Present**
Advised by Prof. Xinyi Li and working with Ms. Yu Liu *Peking University, China*

- Studied the disconnection time of a discrete cylinder $(\mathbb{Z}/N\mathbb{Z})^d \times \mathbb{Z}, (d \geq 2)$ by simple and biased (in the $\mathbb{Z}$ direction) random walks
- For the former, derived a sharp asymptotic lower bound that matches the upper bound from [Sznitman, 09]. For the latter, obtained bounds that asymptotically match in the principal order when the bias is not too strong, which greatly improves [Windisch, 08]
- My contributions: Carried out the whole outline and main technical analysis myself, integrating techniques including potential theory, mixing properties, soft local time, decoupling inequalities, etc.

Random Graph Matching **May 2023 – Oct. 2023**
Advised by Prof. Jian Ding and working with Mr. Yumou Fei *Peking University, China*

- Studied the problem of recovering the latent vertex correspondence between two correlated random graphs with vastly inhomogeneous and unknown edge probabilities between different pairs of vertices
- Obtained an efficient matching algorithm as long as the minimal average degree is at least $\Omega(\log^2 n)$ and the minimal correlation is at least $1 - O(\log^{-2} n)$, inspired by and extending the matching algorithm via degree profiles in [Ding, Ma, Wu, Xu, 18]
- My contributions: Devised the idea of choosing unions of intervals as bins, which enabled us to bypass certain technical difficulties

Planar Random Geometry (at Uchicago Math REU 2023) **June. 2023 – Aug. 2023**
Advised by Prof. Ewain Gwynne *The University of Chicago, United States*

- Accomplished notes on Sheffield's conformal welding theory, covering discussions from discrete models, necessary preliminaries and general results related with the mating-of-trees theory
- Learned various mating-of-trees bijections with respect to Fortuin-Kasteleyn random planar maps, bipolar orientations, Schnyder woods, etc.
- Learned various 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 in *Asterisque*, 2021

Approximate Counting, Markov Chain 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 and proved new log-concavity results related with the problem
- Learned spectral independence, a recent significant development on high-dimensional walks
- Learned the canonical path method featured in profound papers by Jerrum and Sinclair

Honors and Awards

- National Scholarship (the highest honor for a college student in China) 2023
- Silver Medal (ranking top 4 nationally), the 14th S.T. Yau College Student Mathematics Contest, Probability and Statistics Track 2023
- Silver Medal (ranking top 4 nationally), the 14th S.T. Yau College Student Mathematics Contest, Team Awards 2023
- First Prize (ranking top 20 nationally), the 14th National College Student Mathematics Contest 2023
- Merit Student of Peking University 2023
- Three scholarships awarded to top 5% students in School of Mathematical Sciences 2021-2022
- Gold Medal in the 35th China Mathematical Olympiad 2019

Talks and Seminars

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 [Duminil-Copin, Goswami, Raoufi, Severo, Yadin, 20]

Other Student Seminars **2022-2023**
Organized by Prof. Jian Ding and students of Peking Univeristy *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

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
Advanced Theory of Probability (Graduate)	97	Partial Differential Equations	97
Stochastic Processes (Graduate)	95	Topology	96

See here for a full list of math courses.

Standardized Language Tests

- TOEFL iBT, Total 107 (Reading 29, Listening 28, Speaking 24, Writing 26)
- GRE General Test, Total 328+4.0 (Verbal Reasoning 159 with percentile 81%, Quantitative Reasoning 169 with percentile 91%, Analytical Writing 4.0 with percentile 56%)
- GRE Subject Test in Mathematics, 970 with percentile 97%