Hang Du

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EDUCATION

Sept. 2019 - Present Undergraduate Study	School of Mathematical Sciences Peking University (PKU) **GPA:** Overall 3.90/4.0 (92.6/100) Major 3.97/4.0 (95.8/100) **Rank: 4/116** (Among all students majoring in mathematics and applied mathematics at PKU)
Research Interests	Probability Theory and its intersection with Statistical Physics, Computer Science, Combinatorics and Statistics.

WORKS

April 2021 - May 2022	**Sharp Estimates for Probabilities of Arm Events in Critical Planar Percolation.** Preprint: arXiv:2205.15901 (50 pages) Coauthors: Yifan Gao (CityU), Xinyi Li (PKU) and Zijie Zhuang (UPenn) **Descriptions**: We improved the estimates of percolation arm probabilities to a very sharp level, which answered (a large part of) a question of Schramm (ICM Proc., 2006). During this work, I proved the super-strong separation lemma (which is initially conjectured by Garban, Pete and Schramm) and used it as a tool to develop generalized coupling techniques.
Jan 2022 - May 2022	**The Correlated Graph Model: Informational Thresholds for Correlation Detection and Matching Recovery.** Preprints: arXiv:2203.14573 (21 pages) and arXiv:2205.14650 (32 pages) Coauthor: Jian Ding (PKU) **Descriptions**: We determined the informational thresholds for the possibility of testing correlation and (partially) recovering the hidden matching. Our results gave complete answers to fundamental questions in this model, and they also revealed interesting connections between such problems and the densest subgraph problem in Erdős-Rényi random graphs.
July. 2022 - Oct 2022	**A Polynomial-Time Approximation Scheme for the Maximal Overlap of Two Independent Erdős-Rényi Graphs.** Preprint: arXiv:2210.07823 (38 pages). Coauthors: Jian Ding (PKU) and Shuyang Gong (PKU) **Descriptions**: We presented a polynomial-time algorithm which finds a vertex correspondence whose overlap approximates the maximal overlap up to a multiplicative factor that is arbitrarily close to 1, and in particular established the asymptotic of the maximal overlap. Our result added one natural example to the list of few problems that efficient algorithms can be discovered for random instances while worse-cases are known to be NP-hard.

Other Research Experiences

Nov 2021 - Feb 2022	Advised by Prof. Jian Ding, I studied reconstructing the hidden matching between correlated graphs by local algorithms when the noise is small. We also proved the nonexistence of such algorithm when the noise is large.
May 2022 - Present	Advised by Prof. Jian Ding, I studied the method of using subgraph counts as observables to detect correlation between two graphs. We extent the techniques from counting tree to counting general graphs and obtained new results.
June 2022 - Sep 2022	In the 2022 REU program at University of Chicago organized by Prof. Peter May, I studied the convergence of loop-erased random walk to SLE curve in both capacity parameterization and natural parameterization.

A List for Major Courses

Elementary Course	Grade	Probability Course	Grade
Mathematical Analysis I	100	Probability Theory	99
Mathematical Analysis II	100	Applied Stochastic Processes (H)	99
Mathematical Analysis III	96	Mathematical Statistics (H)	100
Functions of Real Variables	96	Advanced Probability Theory (G)	98.5
Functions of Complex Variables	99	Theory of Stochastic Processes (G)	98
Ordinary Differential Equations	94	Stochastic Analysis (G)	94
Functional Analysis	97	Stochastic Processes I[1], II[2] (G)	95, 95
Advanced Algebra I (H)	94		
Advanced Algebra II (H)	95	(H) = Honor, (G) = Graduate	
Abstract Algebra	98	[1] is a course on Malliavian Calcu-	
Geometry I	98	lus and stochastic homogenization	
Geometry II (H)	99	[2] is a course on random geometry,	
Topology	92	combinatorics and spin glasses	

Honors & Awards

Gold Medal in the 13th S.-T. Yau College Mathematics Contests Team medals
One Silver Medal, two Bronze Medals and six winning prizes in previous Yau Contests
First Prize (**Rank 1**) in the 13th National College Student Mathematics Contest
National Scholarship (the **highest honor** for college students in China)
Gold Medal **(Rank 5)** in the 34th China Mathematical Olympiad

Talks & Seminars

Oct. 2022	THU-PKU-BKU Joint Probability Webinar Held by probabilists from Tsinghua, Peking and Beijing Normal University
2020 - 2022	15+ student seminar talks at Peking, including topics in Large Deviation Theory, Random Geometry, Probabilistic Combinatorics and Computer Sciences Two student seminars organized by myself, which are focus on Brownian Motion and discrete probability, respectively. See my homepage for details

Standardized Language Tests

Aug. 2021	TOEFL iBT, Total 106 (Reading 30, Listening 30, Speaking 22, Writing 24)
Feb. 2022	GRE General Test, Total 325+3.5 (Verbal 157, Quantitative 168, Writing 3.5)