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Duan Tu

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EDUCATION

University of Illinois Chicago, Chicago, IL
Ph.D. Candidate in Mathematics — Expected May 2026
M.S. in Mathematics — May 2020 – Dec 2022
- Advisor: Lev Reyzin

University of Florida, Gainesville, FL
B.S. in Mathematics, *magna cum laude* — Aug 2016 – May 2020
- Honors Thesis: Modeling Cell Population and Morphology of Microglia and Dopamine Neurons in the Midbrain of Mice During Aging, advised by Maia Martcheva
- Minor in Violin Performance

RESEARCH INTERESTS

Machine learning theory, combinatorial optimization, theoretical computer science

ONGOING PROJECTS

1. **Johnson-Lindenstrauss Lemma on Sparse Graphs**
   Joint with Vishesh Jain
   In preparation.
2. **Efficient Synthetic Data Generator**
   Joint with Lev Reyzin
   In preparation.
3. **Predicting Annual Daily Traffic (AADT) on the Greater Chicago Highway System Using Graph Neural Networks**
   Joint with Hong Zhang and Zongzhi Li
   In preparation.

PUBLICATIONS

(* indicates alphabetical order)

1. On Sample Reuse Methods for Answering *k*-wise Statistical Queries
   Lev Reyzin*, Duan Tu*.
   In the 18th International Symposium on Artificial Intelligence and Mathematics (ISAIM), 2024.
2. Microglia Senescence Occurs in Both Substantia Nigra and Ventral Tegmental Area

Fatemeh Shaerzadeh, Leah Phan, Douglas Miller, Maxwell Dacquel, William Hachmeister, Carissa Hansen, Alexandra Bechtle, Duan Tu, Maia Martcheva, Thomas Foster, Ashok Kumar, Wolfgang Streit, Habibeh Khoshbouei.
Glia. 2020;68 (11), 2228-2245.

TALKS

On Sample Reuse Methods for Answering k-wise Statistical Queries

- UIC Graduate Student Colloquium, Chicago, IL — Jan 2024
- ISAIM 2024, Fort Lauderdale, FL — Jan 2024
- SLMath Summer Graduate School, IBM Research Almaden, CA — Jul 2023

Modeling Cell Population and Morphology of Microglia and Dopamine Neurons in the Midbrain of Mice During Aging

- NIMBioS Annual Undergraduate Research Conference, UT Knoxville, TN — Nov 2019

WORK EXPERIENCE

Argonne National Laboratory, Lemont, IL
PhD. Research Aide — May 2024 – Aug 2024

- Developed Graph Neural Network (GNN) models to predict traffic volume of selected highway roads in the Greater Chicago Area
- Trained the models with real and simulated traffic network data

AbbVie Inc., Chicago, IL
Mathematical Modeling Intern — May 2022 – Aug 2022

- Developed a MATLAB Web App to calculate the minimal dose rate of antibodies against soluble targets
- Launched the app to an internal web server and demonstrated to the intended user base of 500 scientists

TEACHING AND MENTORING

Directed Reading Program at UIC
Mentor
Topic: Mathematical Foundations of Machine Learning — Spring 2024
Topic: Differential Privacy and Its Real-Life Applications — Fall 2024

University of Illinois Chicago

- Instructor
    - Math 182 Emerging Scholars Workshop for Calculus II: Spring 2024
- Teaching Assistant

- Math 181 Calculus II: Spring 2023, Fall 2023, Spring 2024
- Math 180 Calculus I: Fall 2020, Spring 2021, Spring 2022
- Math 110 College Algebra: Fall 2021
- Math 105 Mathematical Reasoning: Fall 2022

- Grader
  - STAT 401 Introduction to Probability: Fall 2023

SERVICE

UIC CS Theory Seminar, Co-organizer — Aug 2023 – May 2024

UIC AWM Chapter, Organizing Member — Nov 2023 – Present

IDEAL Get Ready for Research Workshop for Undergraduates, Chicago, IL — Jun 2023
Facilitator, Panelist

RELEVANT COURSEWORK

Graduate Coursework at UIC: Theory of Machine Learning, Algorithms, Computational Complexity, High Dimensional Probability, Statistical Theory, Combinatorial Optimization, Probabilistic Combinatorics, Extremal Combinatorics, Statistical Physics Methods in Combinatorics, Enumerative Combinatorics, Numerical PDEs, Information Theory

Graduate Coursework at UF: Real Analysis, Partial Differential Equations, Modeling in Mathematical Biology, Numerical Analysis

Undergraduate Coursework at UF: Complex Analysis, Abstract Algebra, Number Theory, Combinatorics, Numerical Methods with MATLAB

HONORS AND AWARDS

COMAP Mathematical Contest in Modeling — Feb 2020
Honorable Mention Award

Davis United World College Scholar — Aug 2016 – May 2020
Full tuition and living expenses for attending the University of Florida

SKILLS

Programming: MATLAB, Python (PyTorch, NumPy, Pandas), R, SQL, LaTeX, Git, GitHub, HTML
Languages: Mandarin Chinese (Native), English (Bilingual), Spanish (Basic)