Zhexu Jin

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EDUCATION

University of Illinois, Urbana Champaign **08 2023 - 05 2028(Expected)**
Ph.D. in Statistics *Champagne/Urbana, United States*

Duke Kunshan University **08 2019 - 05 2023**
B.S. in Data Science *Kunshan, China*

- Subjects Studied: Combinatorics and Graphs · Statistical Learning Theories · Numerical Analysis and Optimization · Statistical Divergences · Differential Geometry · Advanced Linear Algebra · Real Analysis · Computer Vision
- Graduate with distinction in Signature Work Titled: *Unsupervised Optimal Transport Based Change Point Detection for Air Pollution Data*

Duke University (In person exchange semester) **08 2022 - 12 2022**
B.S. in Interdisciplinary Studies (Subplan in Data Science) *Durham, United States*

- Subjects Studied: Topological Data Analysis · Dimension Reduction · Spectral Graph Theory · Stochastic Petri Net

RESEARCH INTERESTS

I am interested in geometry related problem, such as latent space model for graph, optimal transportation and topological data analysis, especially on **topological data analysis for network data**.
I am also generally fascinated by interdisciplinary problems in data science. In particular, problems in **medical imaging** and **network science**.

PUBLICATIONS

Zhexu Jin, Mario Andrés Velásquez Angel, Ivan Mura, and Juan Felipe Franco. Enriched spatial analysis of air pollution: Application to the city of Bogotá, Colombia . *Frontiers in Environmental Science*, page 1777, 2022a. doi: 10.3389/fenvs.2022.966560. URL https://doi.org/10.3389/fenvs.2022.966560.

Zhexu Jin, Gaoyang Li, Huansheng Cao, and Dongmian Zou. *Towards Geometry-Aware Cell Segmentation in Microscopy Images*. Medical Imaging meets NeurIPS. 36th Conference on Neural Information Processing Systems, 2022b. URL https://nips.cc/media/PosterPDFs/NeurIPS%202022/63451.png.

Shanru Lin, Temirlan Sabyrbayev, **Zhexu Jin**, Gaoyang Li, Huansheng Cao, and Dongmian Zou. Enhancing cell segmentation through efficient topological regularization. In *2024 IEEE 21th International Symposium on Biomedical Imaging (ISBI)*, 2024.

RESEARCH PROJECTS

Human Cell Segmentation

Mentored by Dr. Dongmian Zou **12 2021 – 05 2024**

- Proposed to regularize geometry of the segmentation output produced by network using losses inspired by **persistent homology**
- Sped up the loss computation via a 1-dimensional simplification and implemented the new loss based on lower star filtration. Benchmarked the proposed method against other commonly used instance segmentation methods

Bogotá Air Quality Disparity Analysis

Mentored by Dr. Ivan Mura **12 2021 – 09 2022**

- Performed **spatial-temporal interpolation** on the hourly $PM_{2.5}$ concentration for each neighbourhood & cross validated different spatial-temporal variogram models.
- Designed and implemented visualizations for each region's exposure to air pollution via triangulation on the surface, which revealed disparity of exposure for people with different social and economic status.

Predictive Modeling of Health Care System (Duke Bass Connection)

Mentored by Dr. Ivan Mura **08 2022 – 08 2023**

- Model the chronical disease progression and the effect of health care intervention using stochastic reward net, a generalization of **stochastic petri net**.
- Prepared documentations for people without technical background to create stochastic reward net model based on their specification

INVOLVEMENT

Statistics Doctoral Student Association **08 2023 – 06 2024**
Vice President *Urbana/Champaign, United States*

- Organize research statistics research seminar and social events for doctoral students within the department

Reading Seminar on Optimal Transport **06 2021 – 06 2022**
Organizer and Founder *Kunshan, China*

- Organized weekly reading seminar on the book Computational Optimal Transport
- Implemented optimial transport solvers such as approximate solvers sinkhorn iterations and linear programming solver network simplex.

WORKING EXPERIENCE

Duke Kunshan University **06 2021 – 08 2023**
Research and Teaching Assistant *Kunshan, China*

- Designed textbook material for the course Deep Learning STATS 403.
- Organize weekly reading seminar on computational topological data analysis.

Santoni Shoes Company **06 2021 – 09 2021**
Research Intern *Kunshan, China*

- Predicted Machine Failures in Shoe-making production line and Conducted **Homogeneous tests** on data distribution produced by the machine operations over a series of time

New Ruipeng Pet Company **09 2020 – 01 2021**
Research Intern *Kunshan/Shanghai, China*

- Built statistical models for evaluating customer lifetime value and automating customer segregation using clustering techniques such as **Spectral Clustering** and **information value**.

SKILLS

Languages: Python, Java, JavaScript, SQL, R, C, Matlab, Markdown, HTML,LaTeX
Technologies/Frameworks: PyTorch, TensorFlow, OpenCV, Selenium, GitHub, Git, Conda, CUDA
Mathematical Theories: Persistent Homology, Differential Geometry, Optimization Theory

HORNORS AND SERVICE

- List of Teachers Ranked as Excellent by students (Fall 2023, Spring 2024) - University of Illinois Urbana-Champaign
- University Block Grant Fellowship - University of Illinois Urbana-Champaign
- Graduate with Distinction - Duke Kunshan University
- Undergraduate Conference Travel Grant, Neurips 2022 - Duke Kunshan University
- Student Experitial Learning Fellow - Duke Kunshan University
- Dean's List (Fall 2019, Fall 2021) - Duke Kunshan University