Junyoung Park

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Research Interests

I am generally interested in data analysis with unique geometric structures necessitating rigorous treatment. Much of my research focuses on **compositional data analysis**, including variable selection, dimension reduction, and predictive model development. I am also interested in the recent theory of kernel methods, notably conditional mean embeddings and sufficient dimension reduction.

Education

Ph.D. Candidate in Mathematical Sciences 2018–2024
Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea
(Co)Advisors: Cheolwoo Park, Jeongyoun Ahn

B.S. in Mathematics 2013–2018
Korea University, Seoul, Korea

Experience

Research Assistant in Statistical Learning KAIST
Under the supervision of Prof. Cheolwoo Park and Jeongyoun Ahn 2021–2024

- Kernel methods, compositional data, dimensionality reduction, autoencoder clustering

Research Assistant in Algebraic Geometry KAIST
Under the supervision of Prof. Sijong Kwak 2018–2021

- Projective geometry, syzygies, applied algebraic geometry
- Extensive training in geometry, algebra, and analysis at the graduate level and beyond

Max Planck Institute for Mathematics in the Sciences Leipzig, Germany
Visiting research student Summer 2019

- Attended Summer School on Randomness and Learning in Non-Linear Algebra

University Financial Engineering Association (U.FE.A) Seoul, Korea
Team leader 2016–2017

- Led Master's-level financial engineering & mathematics studies
- Studied stochastic modeling and hedge (pricing) theory of various equity, interest rate derivatives

Awards and Scholarships

- **Presentation Award for Graduate Students**, 2nd place, Korean Statistical Society (KSS) 2022
- **The Outstanding Teaching Assistant Award**, Calculus II, KAIST Fall, 2020
- **University Students Contest of Mathematics**, Silver Awards, Korean Mathematical Society (KMS) 2016, 2017
- **Presidential Science Undergraduate Fellowship**, fully funded for 8 semesters 2013–2018
- **The Korean Mathematical Olympiad (KMO)** 2nd round of middle school division, Gold Awards 2009

Publications

1. **Park, J.**, Ahn, J., and Park, C. (2023), Kernel Sufficient Dimension Reduction and Variable Selection for Compositional Data via Amalgamation, In *International Conference on Machine Learning* (ICML), pp. 27034-27047, PMLR (link).

2. Kang, I., Choi, H., Yoon, Y.-J., **Park, J.**, Kwon, S.-S., and Park, C. (2023), Frechet Distance-Based Cluster Analysis for Multi-Dimensional Functional Data, *Statistics and Computing*, 33(4), 75.

3. **Park, J.**, Yoon, C., Park, C., and Ahn, J. (2022), Kernel Methods for Radial Transformed Compositional Data with Many Zeros, In *International Conference on Machine Learning* (ICML), pp. 17458-17472, PMLR (link).

In progress:

1. Interpretable Composition-To-Composition Dimension Reduction via Conditional Covariance Operator (with Jeongyoun Ahn and Cheolwoo Park), to appear in my Ph.D. dissertation.

Talks

- **2023 Winter Conference, the Korean Statistical Society** 2023
  Sungshin Women's University, Seoul, Korea
  – Title: Interpretable composition-to-composition dimension reduction via conditional covariance operator
- **40th International Conference on Machine Learning (ICML)** (postered) 2023
  Honolulu, HI, USA
  – Title: Kernel sufficient dimension reduction and variable selection for compositional data via Amalgamation
- **2023 Summer Conference, the Korean Statistical Society** 2023
  Pukyong National University, Busan, Korea
  – Title: Kernel sufficient dimension reduction and variable selection for compositional data via Amalgamation
- **2022 Fall KAIST Math Graduate student Seminar** 2022
  KAIST, Daejeon, Korea
  – Title: Kernel methods for radial transformed compositional data with many zeros
- **39th International Conference on Machine Learning (ICML)** (spolight talk) 2022
  Baltimore, MD, USA
  – Title: Kernel methods for radial transformed compositional data with many zeros
  – Presented also at 2022 Summer Conference, the Korean Statistical Society, Seoul (awarded, 2nd place)

Teaching

- **Teaching Assistant** at KAIST (selected list)
  – Statistical Data Science Practice (DS516) Spring 2023
  – Probability and Statistics (MAS250) Fall 2021
  – Abstract Algebra I (MAS311) Spring 2021
  – Mathematical Statistics (MAS355) Fall 2019
  – Matrix Group Theory (MAS435) Spring 2019
    · Gave a guest lecture on connectedness of Lie groups in English
  – Abstract Algebra II (MAS312) Fall 2018
    · Gave several lectures throughout the semester

Computing Skills

- Python (for machine learning, statistics), R (for statistics), previous experiences with Matlab and C.
- Acceleration of optimization: experience in leveraging `TensorFlow AutoGraph` in my research.
- Parallel programming in R: `foreach` package, `mclapply` function in Linux environment.

Languages

- Korean (native)
- English

Hobbies

- Singing, better with playing guitar.
- Running, hiking, and climbing.

References

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