Junyoung Park

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Research Interests

I am generally interested in data analysis with unique geometric structures necessitating rigorous treatment. My recent research focuses on **compositional data analysis**, including variable selection, dimension reduction, and predictive model development. On the theoretical side, I am interested in kernel conditional mean embeddings, sufficient dimension reduction, and high-dimensional statistics.

Education

Ph.D. in Mathematical Sciences 03/2018 - 02/2024
KAIST, Daejeon, Korea
Thesis: Kernel Methods for Compositional Data and Dimensionality Reduction
(Co)Advisors: Cheolwoo Park, Jeongyoun Ahn

B.S. in Mathematics 03/2013 - 02/2018
Korea University, Seoul, Korea

Professional Positions

Postdoctoral Research Fellow (upcoming) 09/2024 -
Department of Biostatistics, University of Michigan, MI, USA
Supervisor: Irina Gaynanova

BK21 Postdoctoral Research Fellow 03/2024 - 08/2024
Natural Science Research Institute, KAIST, Daejeon, Korea
Supervisor: Cheolwoo Park
Funded by the BK21 project in Korea

Experience

Research Assistant in Statistical Learning KAIST
Under the supervision of Prof. Cheolwoo Park and Jeongyoun Ahn 08/2021 - 02/2024

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

Research Assistant in Algebraic Geometry KAIST
Under the supervision of Prof. Sijong Kwak 09/2018 - 07/2021

- 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, invited by Prof. Mateusz Michalek Summer 2019

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

University Financial Engineering Association (U.FE.A) Seoul, Korea
Team leader 03/2016 - 08/2017

- Led Master's-level financial engineering & mathematics studies
- 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 Dimension Reduction for Compositional Data (with Jeongyoun Ahn and Cheolwoo Park), partially appeared in my Ph.D. dissertation.

Talks

- **2023 Winter Conference, the Korean Statistical Society** 12/2023
  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) 07/2023
  Honolulu, HI, USA
  – Title: Kernel sufficient dimension reduction and variable selection for compositional data via Amalgamation
- **2023 Summer Conference, the Korean Statistical Society** 06/2023
  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** 10/2022
  KAIST, Daejeon, Korea
  – Title: Kernel methods for radial transformed compositional data with many zeros
- **39th International Conference on Machine Learning (ICML)** (spolight talk) 06/2022
  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

Academic Services

- **Journal Refereeing**
  - Biometrics
  - WIREs Computational Statistics

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 (experience in Linux environment)

Languages

- Korean (native)
- English

Hobbies

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

References

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and Graduate School of Data Science
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Sijong Kwak (former advisor in mathematics)
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