# Junyoung Park

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## Research Interests

I am broadly interested in data analysis that involves unique geometric structures necessitating rigorous treatment. My recent research focuses on distributional data analysis for applications to wearable device data. In addition, I have an interest in compositional data analysis for microbiome data and various dimension reduction methods.

## Professional Positions

**Postdoctoral Research Fellow** 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

## 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

## 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

**Technical Research Personnel** KAIST
For military duty in South Korea 03/2020 – 02/2023

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

- Projective algebraic geometry, syzygies, applied algebraic geometry

**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

*Preprints/Submitted:*

4. **Park, J.**, Kok, N., and Gaynanova, I. (2025+) "Beyond fixed thresholds: optimizing summaries of wearable device data via piecewise linearization of quantile functions." Preprint available on arXiv:2501.11777.

*Peer-reviewed publications:*

3. **Park, J.**, Ahn, J., and Park, C. (2023), "Kernel Sufficient Dimension Reduction and Variable Selection for Compositional Data via Amalgamation." *International Conference on Machine Learning* (ICML), pp. 27034-27047, PMLR
Link: https://proceedings.mlr.press/v202/park23a.html.

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.
Link: https://doi.org/10.1007/s11222-023-10237-z

1. **Park, J.**, Yoon, C., Park, C., and Ahn, J. (2022), "Kernel Methods for Radial Transformed Compositional Data with Many Zeros." *International Conference on Machine Learning* (ICML), pp. 17458-17472, PMLR
Link: https://proceedings.mlr.press/v162/park22d.html.

*In progress:*

1. Fréchet regression of multivariate distributions (with Irina Gaynanova)

2. Interpretable Dimension Reduction for Compositional Data (with Jeongyoun Ahn and Cheolwoo Park)

## Talks

- **2024 Joint Statistical Meetings** 08/2024
Oregon Convention Center, Portland, OR, USA
  - Title: Interpretable dimension reduction for compositional data
- **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 guest lectures throughout the semester

## Academic Services

- **Journal Refereeing**
  - Annals of Applied Statistics (2)
  - Biometrics (3)
  - WIREs Computational Statistics (1)

## Computing Skills

- Python (for machine learning, statistics), R (for statistics), previous experiences with Matlab and C
- Acceleration of optimization: `TensorFlow` `AutoGraph` and `Pytorch`
- Linux environment and high-performance computing (HPC) cluster systems

## Languages

- Korean
- English

## Hobbies

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

## References

**Cheolwoo Park**
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**Sijong Kwak** (former advisor in mathematics)
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