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

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: experience in leveraging `TensorFlow AutoGraph`
- 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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and Graduate School of Data Science
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Sijong Kwak (former advisor in mathematics)
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