Minsuk Kim

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Contact Information

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Research Statement

My research explores the interplay between transportation infrastructure, human mobility, and the accessibility of urban amenities. I employ tools from network science, statistical physics, and machine learning to uncover the underlying dynamics that shape mobility patterns and urban accessibility. My work extends to broader topics such as phase transitions and dynamics on networks, unsupervised representation learning, and geospatial data analysis with the goal of advancing our understanding of various complex systems.

Education

Ph.D. Informatics, Indiana University, Bloomington, IN, USA — August 2022–present

- Track: Complex Networks and Systems
- Minor: Computer Science
- Advisor: Professor Filippo Radicchi
- Dissertation: Data-driven modeling of complex transportation and mobility systems

M.S. Physics, Kyung Hee University, Seoul, Korea — March 2019–February 2021

- Concentration: Statistical Physics
- Advisor: Professor Soon-Hyung Yook
- Thesis: Spreading of consensus and epidemic on complex networks (Written in Korean)

B.S. Physics, Kyung Hee University, Seoul, Korea — March 2013–February 2019

Publications

Journal Articles

J1. **Kim, Minsuk**, Cirigliano, L., Castellano, C., Sun, H., Jankowski, R., Poggialini, A. & Radicchi, F. Shortest-path percolation on scale-free networks. *Physical Review E* **113,** 014314 (2026).

J2. **Kim, Minsuk**, Diggans, C. T. & Radicchi, F. Modeling resource consumption in the US air transportation system via minimum-cost percolation. *Nature Communications* **16,** 8105 (2025).

J3. **Kim, Minsuk** & Yook, S.-H. Effect of isolation strategies on epidemic spreading in multiplex networks with an annealed interactions layer. *Journal of the Korean Physical Society* **86,** 73–84 (2025).

J4. **Kim, Minsuk** & Radicchi, F. Shortest-Path Percolation on Random Networks. *Physical Review Letters* **133,** 047402 (2024).

J5. Kaiser, D., Patwardhan, S., **Kim, Minsuk** & Radicchi, F. Reconstruction of multiplex networks via graph embeddings. *Physical Review E* **109,** 024313 (2024).

J6. **Kim, Minsuk** & Yook, S.-H. Majority-vote model with degree-weighted influence on complex networks. *Physical Review E* **103,** 022302 (2021).

Peer-reviewed Conference Proceedings

C1. Aiyappa, R., DeVerna, M. R., Pote, M., Truong, B. T., Zhao, W., Axelrod, D., Pessianzadeh, A., Kachwala, Z., Kim, M., Seckin, O. C., **Kim, Minsuk**, Gandhi, S., Manikonda, A., Pierri, F., Menczer, F. & Yang, K.-C. *A multi-platform collection of social media posts about the 2022 us midterm elections* in *Proceedings of the international AAAI conference on web and social media* **17** (2023), 981–989.

Under Review

R1. Weng, G., **Kim, Minsuk**, Ahn, Y.-Y. & Moro, E. Beyond Distance: Mobility Neural Embeddings Reveal Visible and Invisible Barriers in Urban Space. *arXiv:2506.24061* (2025).

Honors and Awards

Fellowship

- U.S. Department of the Air Force Summer Faculty Fellowship Program, 2024
- Luddy Doctoral Summer Fellowship, Indiana University, 2023, 2025

Scholarship

- Scholorship of Dean of Graduate School, Kyung Hee University, 2019
- Superiority Scholarship, Kyung Hee University, 2017
- Examplary Scholarship, Kyung Hee University, 2013, 2014

Conference

- Best Oral Presentation Award, The 21st Workshop for Statistical Physics (Online), 2021
- Best Poster Presentation Award, The Korean Physical Society Spring Meeting, (Online), 2020
- Best Oral Presentation Award, The 20th Workshop for Statistical Physics (Byeonsan, Korea), 2019

Miscellaneous

- Best Project Award, The 19th KIAS-APCTP Winter School on Statistical Physics, (Pohang, Korea), 2022
- Best Project Award, The 17th KIAS-APCTP Winter School on Statistical Physics, (Pohang, Korea), 2020
- Excellence Project Award (3rd place), The 10th KIAS CAC Summer School on Scientific Computing & Artificial Intelligence, (Seoul, Korea), 2019

Teaching

Indiana University

- Associate Instructor
  - Performance Analytics (INFO-I369) — Spring 2025, Fall 2025

Kyung Hee University

- Guest Lecturer
  - Advanced Statistical Physics (PHYS7037) — November 15th, 2021
    title: "Finite-size scaling analysis in Statistical Physics"
  - Statistical Mechanics 2 (PHYS7072) — December 14th, 2020
    title: "Statistical Physics of Opinion Dynamics"
- Teaching Assistant
  - Modern Physics (PHYS2309) — Spring 2019, Spring 2020
  - Computational Physics (PHYS3308) — Spring 2019, Spring 2020
  - Informations for Physics (PHYS3310) — Fall 2019, Fall 2020

Mentoring

M.S. and post-undergraduate students

- Bilal Sultan (Data Science, Indiana University) — 2025-present

Undergraduate students

- Bilal Sultan (Data Science, Indiana University) 2024-2025

Presentations

Conference talks

- NetSci 2025, "Minimum-cost percolation on US air transportation network" (Maastricht, Netherlands, June, 2025)
- NetSci 2025 Satellite Symposium: Critical Phenomena In Networks, "Shortest-path percolation on complex networks" (Maastricht, Netherlands, June, 2025)
- IC2S2 2024, "Unsupervised embedding of mobility reveals invisible barriers in US cities" (Philadelphia, PA, USA, July, 2024)
- NetSci 2024, "Shortest-path percolation on complex networks" (Québec City, Canada, June, 2024)
- APS March Meeting, "Shortest-path percolation on complex networks" (Minneapolis, MN, USA, March, 2024)
- The 21st Workshop for Statistical Physics, "Control of epidemic spreading on layered networks" (Online, August, 2021)
- KPS Spring Meeting, "Effective epidemic control model on multilayer networks" (Online, April, 2021)
- The 20th Workshop for Statistical Physics, "Degree-weighted Majority-vote model on Complex Networks" (Byeonsan, Korea, August, 2019)

Conference posters

- NetMob 2024 data challenge, "Investigating Human Mobility Patterns with Field Theory and Open Data Sources" (Washington, D.C., USA, October, 2024)
- KPS Spring Meeting, "Impact of degree-weighted influence in the Majority-vote dynamics on Complex Networks" (Online, July, 2020)
- KPS Fall Meeting, "Majority-vote model with degree-weighted influence on Complex Networks" (Gwangju, Korea, October, 2019)

Colloquia and Seminars

- Department of Physics, Kyung Hee University, "Shortest-path percolation on complex networks", (Seoul, Korea, December 20th, 2024)
- Complex Systems Research Exchange (CREx), "Shortest-path percolation on complex networks", (Online, January 30th, 2024)
- Kyung Hee University Academic Society Seminar: Scaling and Theoretical Physics, "Finite-size scaling analysis in Statistical Physics" (Seoul, Korea, November 26th, 2021)
- Kyung Hee University Theoretical physics research group seminar, "Majority-vote model with degree influence on complex networks" (Seoul, Korea, May 22nd, 2020)

Service

Reviewer

- Journal: Communications Physics, IEEE Transaction on Network Science and Engineering, Nature Communications, Physical Review E, Scientific Reports
- Conference: NetSci (2026, 2025), IC2S2 (2025, 2024)

Skills

Programming Language: C, Python, R
Relevant tools: NetworkX, Gephi, OSMnx, Geopandas, statsmodels
Specialization: Monte Carlo simulation, Finite-size scaling analysis
Language: Korean (native), English (fluent)

References

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