YOUNG-GEUN KIM

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https://kyg0910.github.io/
https://scholar.google.com/citations?user=HVqiptEAAAAJ

RESEARCH INTERESTS

My research interests revolve around developing innovative data science tools and promoting their dissemination on biomedical data. Research topics include, but are not limited to:

- Deep generative models for multi-modal biomedical data (e.g., neuroimaging and multi-omics)
- Deep learning for identifying biomarkers associated with mental illness
- Reinforcement learning-based health care

PROFESSIONAL APPOINTMENTS

Assistant Professor *Aug. 2024 - Present*
Department of Statistics and Probability, Michigan State University

EDUCATION & TRAINING

Adjunct Associate Research Scientist *Jul. 2021 - Aug. 2024*
Department of Biostatistics, Columbia University
Mentor: Ying Liu, Ph.D.

Postdoctoral Researcher *Jul. 2021 - Aug. 2024*
Department of Psychiatry, Columbia University
Mental Health Data Science, New York State Psychiatric Institute
Mentor: Ying Liu, Ph.D.

Postdoctoral Researcher *Mar. 2021 - Jun. 2021*
Department of Statistics, Seoul National University
Mentor: Myunghee Cho Paik, Ph.D.

Seoul National University *Mar. 2015 - Feb. 2021*
Ph.D. in Statistics Graduated with the Best Dissertation Award
Advisor: Myunghee Cho Paik, Ph.D.
Dissertation: Statistical distance of conditional distributions and its applications

Seoul National University *Mar. 2010 - Feb. 2015*
Triple Major Graduated with Honors (Cum Laude)
B.S. in Industrial Engineering
B.S. in Statistics
B.S. in Mathematical Sciences

HONORS & AWARDS

Career Development Award *Dec. 2023*
Korean International Statistical Society

Outstanding Reviewer Award *Jul. 2022*
Thirty-ninth International Conference on Machine Learning

Best Dissertation Award *Feb. 2021*
College of Natural Sciences, Seoul National University

Seoul National University Innovation Program Scholarship *Mar. 2017 - Feb. 2018*
Seoul National University
∗ Awarded to the Ph.D. student with the highest GPA in the department.

1st Prize, Student Paper Competition *June 2017*
Korean Statistical Society

PUBLICATIONS & PREPRINTS

∗: First author; ‡: Corresponding author

Journal

1. Kim, S.*, **Kim, Y.-G.**, and Wang, Y.‡ (2024). Temporal generative models for learning heterogeneous group dynamics of ecological momentary data. *Biometrics.* [Paper] [Code]
   - **Top 12** Statistics and Probability journal (H-index: 149; upper 4.5%)

2. **Kim, Y.-G.***, Ravid, O.*, Zheng, X., Kim, Y., Neria, Y., Lee, S., He, X.‡, and Zhu, X.‡ (2024). Explaining deep learning-based representations of resting state functional connectivity data: focusing on interpreting nonlinear patterns in autism spectrum disorder. *Frontiers in Psychiatry, section Computational Psychiatry.* [Paper] [Code]
   - **Top 86** Psychiatry and Mental Health journal (H-index: 114; upper 14.9%)

3. **Kim, Y.-G.***, Lee, K., and Paik, M.C.‡ (2022). Conditional Wasserstein generator. *IEEE Transactions on Pattern Analysis and Machine Intelligence.* [Paper] [Code]
   - **Top 1** Applied Mathematics journal (H-index: 417; upper 0.2%)

4. **Kim, Y.-G.***, Kwon, Y., and Paik, M.C.‡ (2019). Valid oversampling schemes to handle imbalance. *Pattern Recognition Letters*, 125 (1): 661-667. [Paper] [Code]
   - **Top 13** AI journal (H-index: 181; upper 4.0%)

Peer-reviewed Conference

1. **Kim, Y.-G.***, Hu, M.-C., Nunes, E. V., Luo, S. X.‡, and Liu, Y.‡ (2025). Optimizing contingency management with reinforcement learning. *IEEE International Conference on Healthcare Informatics.* Selected as a long presentation [Paper] [Code]

2. Yu, W.*, Qu, G., **Kim, Y.-G.**, Xu, L., and Zhang, A.‡ (2025). A Novel GNN Framework Integrating Neuroimaging and Behavioral Information to Understand Adolescent Psychiatric Disorders. *Medical Imaging with Deep Learning.* [Paper] [Code]

3. **Kim, Y.-G.***, Liu, Y.‡, and Wei, X. (2023). Covariate-informed representation learning to prevent posterior collapse of iVAE. *Proceedings of the Twenty Third International Conference on Artificial Intelligence and Statistics (AISTATS 2023).* [Paper] [Code]

4. Kim, M.*, **Kim, Y.-G.**, Kim, D., Kim, Y., and Paik, M.C.‡ (2021). Kernel-convoluted deep neural networks with data augmentation. *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI 2021).* [Paper] [Code]

5. **Kim, Y.-G.***, Kwon, Y., Chang, H., and Paik, M.C.‡ (2020). Lipschitz continuous autoencoders in application to anomaly detection. *Proceedings of the Twenty Third International Conference on Artificial Intelligence and Statistics (AISTATS 2020).* [Paper] [Code]

Patents

1. Paik, M.C.‡, **Kim, Y.-G.**, and Lee, K. (2024). Method and apparatus for conditional data generation using conditional Wasserstein generator. *KR Patent 102734936B1.* [Info]

2. Paik, M.C.‡, **Kim, Y.-G.**, and Chang, H. (2021). Learning method and learning device for high-dimension unsupervised anomaly detection using kernalized Wasserstein autoencoder to lessen too many computations of Christophel function, and testing method and testing device using the same. *KR Patent 102202842B1.* [Info]

Preprints

1. **Kim, Y.-G.***, Lee, K., Choi, Y., Won, J.-H., and Paik, M.C.‡ (2023). Wasserstein geodesic generator for conditional distributions (under *Major Revision* at Journal of Machine Learning Research). [ArXiv][Code]

2. Zheng, X.*, Ravid, O., Barry, R. A.J., Kim, Y., Wang, Q., **Kim, Y.-G.**, Zhu, X.‡ and He, X.‡ (2024). Denoising Variational Autoencoder as a Feature Reduction Pipeline for the diagnosis of Autism based on Resting-state fMRI. [ArXiv]

Work in Progress

1. **Kim, Y.-G.*‡** and Liu, Y. Mid-VAE: Multi-modal, Identifiable, and Disentangled Representation Learning for Children's Structural Brain Imaging. Work in progress
   - Preliminary results were presented at ABCD AIIM conference.

2. Yang, B.*, **Kim, Y.-G.**, and Wang, Y.‡ Representation learning for optimizing individualized treatment decisions. Work in progress.
   - This work was selected as the Runner-up in the student paper competition for the Statistics in Imaging Section of the ASA in 2025.

GRANTS & FUNDING

Active

- **Statistical understanding of adversarial training in neural networks** *Aug. 2025 - Jul. 2028* *$180,000*
  National Science Foundation DMS PD 18-1269
  Role: **Co-PI** (**PI**: Dr. Yue Xing, Michigan State University)

Under Review

- **Statistical method for neural mechanism mediating and moderating cognitive system in Alzheimer's disease and aging research** *Dec. 2025 - Dec. 2030* *(If accepted)*
  National Institutes of Health NIA PAR-25-332 (R01)
  - It is an inter-university project, including Columbia University, Michigan State University, University of Texas at Arlington, and the University of Michigan.
  Role: **Sub-PI** (**PI**: Dr. Seonjoo Lee, Columbia University)

Past

- **A data science framework for empirically evaluating and deriving reproducible and transferrable RDoC constructs in youth (R01)** *Jul. 2021 - Aug. 2024*
  National Institutes of Health NIMH
  Role: **Research scientist**

- **Deep learning with incomplete and sequential data: Application to biomedical data** *Mar. 2020 - Jun. 2021*
  National Research Foundation of Korea
  Role: **Research scientist**

- **Development of low-yield trackers via causal inference** *May 2019 - Nov. 2019*
  SK Telecom
  Role: **Research scientist**
- **Statistical approaches to deep learning: New methods for convolutional neural networks in application to medical imaging data** *Mar. 2017 - Feb. 2020*
  National Research Foundation of Korea
  Role: **Research scientist**
- **Deep Learning for the CT based Acute Cerebral Infarction Classification and Lesion Segmentation** *July 2016 - May 2019*
  National Research Foundation of Korea
  - Collaborated with Seoul National University Bundang Hospital
  Role: **Research scientist**
- **New Robust Methods for Missing or Censored Covariates** *Mar. 2016 - Nov. 2016*
  National Research Foundation of Korea
  Role: **Research scientist**

SELECTED TALKS

Invited Talks

- **Kim, Y.-G.**, Lee, K., Choi, Y., Won, J.-H., and Paik, M.C. (2025). Wasserstein geodesic generator for conditional distributions. *The 2025 International India Statistical Association (IISA), Lincoln, NE.*
- **Kim, Y.-G.**, Luo, S. X., Brandt, L., Cheung, K., Nunes, E. V., Roll, J., and Liu, Y. (2024). Optimizing contingency management interventions in substance use disorder treatment with reinforcement learning. *The Joint Statistical Meetings (JSM), Portland, OR.*
- **Kim, Y.-G.** and Liu, Y. (2024). Deep Identifiable Generative Models for Multi-Modal Data Analysis. *The 2024 International Chinese Statistical Association (ICSA) Applied Statistics Symposium, Nashville, TN.*
- **Kim, Y.-G.**, Kwon, Y., Chang, H., and Paik, M.C. (2019). Lipschitz continuous autoencoders in application to anomaly detection. *IMS-China International Conference on Statistics and Probability, Dalian, China.*

Contributed Talks

- **Kim, Y.-G.**, Liu, Y., and Wei, X. (2023). Covariate-informed representation learning to prevent posterior collapse of iVAE. *The Twenty Third International Conference on Artificial Intelligence and Statistics (AISTATS 2023), Palau de Congressos, Valencia, Spain.*[†]
- **Kim, Y.-G.**, Kwon, Y., Chang, H., and Paik, M.C. (2020). Lipschitz continuous autoencoders in application to anomaly detection. *The 23rd International Conference on Artificial Intelligence and Statistics (AISTATS 2020), Virtual conference due to COVID-19.*
- **Kim, Y.-G.** and Liu, Y. (2024). Explaining Nonlinear Patterns in Children's Structural MRI with Multi-modal Identifiable VAE. *The ABCD Insights & Innovations Meeting, MD.*[†]
- **Kim, Y.-G.**, Liu, Y., Brandt, L., Cheung, K., Nunes, E. V., Roll, J., and Luo, S. X. (2023). Optimizing contingency management in substance use disorder treatment using off-policy policy evaluation. *Eastern North American Region (ENAR) 2023 Spring meeting.*

† indicates a poster presentation.

TEACHING EXPERIENCE

Instructor

- **STT 441: Probability and Statistics I: Probability** *Fall 2025*
  Michigan State University
  - An undergraduate-level course covering topics such as normal approximation, sampling distributions, parameter estimation, and elementary tests of hypotheses.
- **STT 351: Probability and Statistics for Engineering** *Summer 2025*
  Michigan State University
  - An undergraduate-level course covering topics such as probability models and random variables, estimation, confidence intervals, hypothesis testing, simple linear regression, and applications to engineering.
- **STT 890: Statistical Problems** *Summer 2025*
  Michigan State University
  - A graduate-level course for individualized study on selected problems
- **STT 997: Advanced Topics in Statistics** *Spring 2025*
  Michigan State University
  - **Developed a new course** [CourseMaterial]
  - A graduate-level course covering recent topics in deep generative models and their applications

Guest Lecturer

- **Statistical Practice and Research for Interdisciplinary Sciences (SPRIS)** *Spring 2025*
  Columbia University
  - Graduate-level course on interdisciplinary research topics in Biostatistics.
  - Will give a lecture "Variational Autoencoders and Their Applications to Multi-modal Data Analysis."
- **STT 990: Statistics & Probability** *Fall 2024*
  Michigan State University
  - Graduate-level seminar course.
  - Gave the lecture "Deep Generative Model: A Statistical Perspective."
- **Statistical Practice and Research for Interdisciplinary Sciences (SPRIS)** *Spring 2024*
  Columbia University
  - Graduate-level course on interdisciplinary research topics in Biostatistics.
  - Gave the lecture "Recent Topics on Conditional Generative Models."
- **Deep Learning: A Statistical Perspective** *Fall 2021*
  Seoul National University
  - Graduate-level course on deep learning.
  - Gave the lecture "Conditional Image Synthesis and Its Applications" in English.

MENTORSHIP EXPERIENCE

Co-mentoring Graduate Students at Columbia University

- Bin Yang, Ph.D. Candidate, Department of Biostatistics April. 2024 - Present
  - Conducted regular weekly meetings with Dr. Yuanjia Wang.
  - Provided mentorship on the following work:

Yang, B., **Kim, Y.-G.**, and Wang, Y. Representation learning for optimizing individualized treatment decisions. Work in progress.
- This work was selected as the Runner-up in the student paper competition for the Statistics in Imaging Section of the ASA in 2025.

- Soohyun Kim, Ph.D., Department of Biostatistics Mar. 2022 - Sep. 2024
  - Conducted regular weekly meetings with Dr. Yuanjia Wang.
  - Provided mentorship on the doctoral dissertation and the following paper:
  Kim, S., **Kim, Y.-G.**, and Wang, Y. (2024). Temporal generative models for learning heterogeneous group dynamics of ecological momentary data. *Biometrics.* [Paper] [Code]

- Zekai Jin, Master Student, Department of Biostatistics Dec. 2022 - Oct. 2023
  - Conducted regular bi-weekly meetings with Dr. Seonjoo Lee.
  - Provided mentorship on deep learning-based EEG denoising methods.

OTHER PROFESSIONAL ACTIVITIES

Event Chairing

- Invited Session at East Asia Chapter of International Society for Bayesian Analysis 2025 (role: **Chair**); Title: Recent Developments in a Bayesian Framework
- Invited Session at 2025 International Indian Statistical Association (role: **Speaker**); Title: Wasserstein Geodesic Generator for Conditional Distributions
- Invited Session at Joint Statistical Meetings 2024 (role: **Organizer & Speaker**); Title: Reliable and Cost-effective Mental Health Care with Reinforcement Learning [Info]
- Invited Session at 2024 International Chinese Statistical Association (role: **Speaker**); Title: Recent Advances in Precision Medicine and Adaptive Experiments [Info]
- Invited Session at Eastern North American Region 2023 (role: **Chair**); Title: Advanced Methods for Analyzing Large-Scale Neuroimaging Data from Nationwide Consortiums for Mental Health Research [Info]
- Oral Presentation Session at International Conference on Machine Learning 2022 (role: **Chair**); Title: Theory [Info]
- Invited Session at IMS-China International Conference on Statistics and Probability 2019 (role: **Speaker**); Title: Lipschitz continuous autoencoders in application to anomaly detection.

Reviewer (Journal)

- Expert Systems with Applications (42 submissions)
- JAMA Psychiatry (2 submissions)
- Biostatistics (1 submission)
- Physica A: Statistical Mechanics and its Applications (1 submission)
- Statistics and Data Science in Imaging (2 submissions)
- International Journal of Computer Assisted Radiology and Surgery (3 submissions)
- Journal of the Korean Statistical Society (2 submissions)

Reviewer (Conference)

- International Conference on Machine Learning 2022

- International Conference on Artificial Intelligence and Statistics 2022 and 2023