Hyunseok Seung

hseung2@wisc.edu
hseung88.github.io
1210 West Dayton Street
Madison, WI 53706

Professional Appointments

2025 – Present **Postdoctoral Research Associate**, *Department of Statistics*, *University of Wisconsin-Madison*, Madison, WI
Advisor: Matthias Katzfuss

Education

2019 – 2025 **Ph.D.** in Statistics, *University of Georgia*, Athens, GA
Advisors: Jaewoo Lee and Yuan Ke
Dissertation: *Scalable and Efficient Learning: Algorithmic Advances for Time Series and Deep Neural Models*

2016 – 2018 **M.A.** in Applied Statistics, *Yonsei University*, Seoul, South Korea
Advisor: Sangun Park
Thesis: *Modified Likelihood Ratio Tests for Extreme Value Distributions*

2008 – 2016 **B.A.** in Applied Statistics, *Yonsei University*, Seoul, South Korea

Research Experience

2025 – Present **Postdoctoral Researcher**, *Department of Statistics*, *University of Wisconsin – Madison*
– **Hyperspectral Foundation Modeling** (advised by Matthias Katzfuss and Sunduz Keles)

- Pre-training vision transformer foundation models on hyperspectral spectra data, followed by fine-tuning for downstream trait prediction.

2022 – 2025 **Research Assistant**, *School of Computing*, *University of Georgia*
– **Deep Learning Optimization** (advised by Jaewoo Lee)

- Developed a curvature-aware zeroth-order optimization method for fine-tuning LLMs, achieving faster convergence and higher test accuracy than state-of-the-art methods, while cutting memory usage by up to 27% compared to MeZO-Adam.
- Developed scalable second-order optimization methods using activation covariance, improving test accuracy by 3.6% on vision transformers compared to AdamW.

2023 – 2024 **Research Assistant**, *Department of Educational Psychology*, *University of Georgia*
– **Topic Modeling** (advised by Shiyu Wang)

- Analyzed video and text data using automatic speech recognition and topic modeling, collaborating with researchers in mathematics education and psychology.

2021 – 2023 **Research Assistant**, *Department of Statistics*, *University of Georgia*

– **Time Series Forecasting**, (advised by Yuan Ke)

- Developed hybrid COVID-19 mortality forecasting models. Utilized online autocovariance change point detection to boost model accuracy by 6% and reduce training time by 99% compared to standard rolling-window cross validation.

2018 **Associate Researcher**, *SK hynix Inc.*, South Korea
– **Wafer Failure Early Detection System** (advised by Sangun Park)

- Streamlined semiconductor production by identifying key predictors of wafer failure, using statistical models for high-dimensional fabrication data.

Publications

Peer-reviewed Conference Proceedings

C1. **Hyunseok Seung**, Lee, J. & Ko, H. *MAC: An Efficient Gradient Preconditioning using Mean Activation Approximated Curvature* in *IEEE International Conference on Data Mining (ICDM)* (2025).

C2. **Hyunseok Seung**, Lee, J. & Ko, H. *An Adaptive Method Stabilizing Activations for Enhanced Generalization* in *IEEE International Conference on Data Mining (ICDM) Workshop* (2024).

C3. **Hyunseok Seung**, Lee, J. & Ko, H. *NysAct: A Scalable Preconditioned Gradient Descent using Nystrom Approximation* in *IEEE International Conference on Big Data* (2024).

Journal Articles

J1. **Hyunseok Seung** & Park, S. Modified Likelihood Ratio Tests for Extreme Value Distributions. *Communications in Statistics - Theory and Methods* **52,** 5742–5751 (2023).

Manuscripts in Progress

W1. **Hyunseok Seung**, Lee, J. & Ko, H. *Low-Rank Curvature for Zeroth-Order Optimization in LLM Fine-tuning* 2026.

W2. **Hyunseok Seung**, Han, K., Shen, Y. & Ke, Y. *Enhancing COVID-19 Mortality Prediction with Online Autocovariance Change Points Detection.* 2024.

Presentations

Talks

T1. **Hyunseok Seung**, Lee, J. & Ko, H. *A Scalable Preconditioned Gradient Descent using Nystrom Approximation.* 2024 IEEE International Conference on Big Data (Washington, DC, USA). Dec. 2024.

Posters

P1. **Hyunseok Seung** & Lee, J. *NysAct: A Scalable Preconditioned Gradient Descent using Nystrom Approximation.* 2025 AI Research Day, Institute for Artificial Intelligence (Athens, GA, USA). Apr. 2025.

P2. **Hyunseok Seung** & Lee, J. *An Adaptive Method Stabilizing Activations for Enhanced Generalization*. 2024 AI Research Day, Institute for Artificial Intelligence (Athens, GA, USA). Apr. 2024.

Teaching

University of Georgia

2019 – 2023	**Teaching Assistant**	
	– Design Analysis Experiments, STAT6430	Spring 2023
	– Statistical Methods for Researchers, STAT6315	Spring 2023
	– Advanced Statistical Applications and Computing, STAT8330	Fall 2022
	– Applied Linear Models, STAT6420	Fall 2022
	– Applied Regression Analysis, STAT4230	Spring 2022
	– Program and Data Lit using R, STAT2360	Fall 2021
	– Statistical Methods, STAT4210	Spring 2021
	– Statistical Inference Bioinformatics, STAT8440	Fall 2020
	– Intro to Statistical Methods, STAT6210	Fall 2020
	– Intro to Statistics for Life Science, STAT3110	Summer 2020
	– Intro to Probability for Life Science, STAT3120	Spring 2020
	– Statistical Methods, STAT6210	Fall 2019

Yonsei University

2018	**Lecturer**	
	– Introduction to Statistics, STAT1001	Fall 2018
2017 – 2018	**Teaching Assistant**	
	– Introduction to Statistics, STAT1001	Spring 2018
	– Introduction to Statistics, STAT1001	Fall 2017
	– Introduction to Statistics, STAT1001	Spring 2017

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