# Hyunseok Seung

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## 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

## Publications

### Peer-reviewed Conference Proceedings

C1. **Hyunseok Seung**, Lee, J. & Ko, H. *Low-Rank Curvature for Zeroth-Order Optimization in LLM Fine-Tuning* in *AAAI Conference on Artificial Intelligence* (2026).

C2. **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).

C3. **Hyunseok Seung**, Lee, J. & Ko, H. *An Adaptive Method Stabilizing Activations for Enhanced Generalization* in *IEEE International Conference on Data Mining Workshop (ICDMW)* (2024).

C4. **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 Submitted

W1. **Hyunseok Seung**, Han, K., Shen, Y. & Ke, Y. *Enhancing COVID-19 Mortality Prediction with Online Autocovariance Change Points Detection*

W2. **Hyunseok Seung**, Lee, J. & Ko, H. *Mean Activation Curvature for Scalable Second-Order Optimization in Deep Networks (Invited for journal extension from IEEE ICDM 2025 best-ranked paper selection)*

## Awards & Honors

2019–2024 Teaching Assistantship (Stipend), *University of Georgia*
2018 Industry-Sponsored Scholarship Recipient, *SK hynix Inc.*
2018 Best Paper Presentation Award, *Korean Data and Information Science Society (KDISS)*
2017–2018 Brain Korea 21 Fellowship, *Korean Government-Funded Graduate Program*
2015 Honors Award, *Yonsei University*

## Research

2025 – Present **Postdoctoral Researcher**, *Department of Statistics, University of Wisconsin – Madison*
**– Bayesian Optimization** (advised by Matthias Katzfuss)

- Developing scalable Bayesian optimization methods.

**– Hyperspectral Foundation Modeling** (advised by Matthias Katzfuss and Sunduz Keles)

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

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.

2017–2018 **Research Assistant**, *Department of Applied Statistics*, *Yonsei University*, South Korea
– **Modified Likelihood Ratio Tests** (advised by Sangun Park)

- Developed modified likelihood ratio test statistics tailored to highly skewed settings to improve sensitivity to tail departures.

# Teaching

## University of Georgia

2019 – 2023 **Teaching Assistant**

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

## Yonsei University

2018 **Lecturer**

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| – STAT1001 Introduction to Statistics | Fall 2018 |

2017 – 2018 **Teaching Assistant**

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|---|---|
| – STAT1001 Introduction to Statistics | Spring 2018 |
| – STAT1001 Introduction to Statistics | Fall 2017 |
| – STAT1001 Introduction to Statistics | Spring 2017 |

# Presentations

## Oral

T1. *An Efficient Gradient Preconditioning using Mean Activation Approximated Curvature* 2025 IEEE International Conference on Data Mining (Washington, DC, USA). Nov. 2025.

T2. *A Scalable Preconditioned Gradient Descent using Nystrom Approximation* 2024 IEEE International Conference on Big Data (Washington, DC, USA). Dec. 2024.

T3. *Modified Likelihood Ratio Tests for Extreme Value Distributions* The Korean Data and Information Science Society (Pukyong University, Busan, South Korea). May 2018.

### Posters

P1. *Low-Rank Curvature for Zeroth-Order Optimization in LLM Fine-Tuning* AAAI Conference on Artificial Intelligence (Singapore). Jan. 2026.

P2. *A Scalable Preconditioned Gradient Descent using Nystrom Approximation* AI Research Day, Institute for Artificial Intelligence (Athens, GA, USA). Apr. 2025.

P3. *An Adaptive Method Stabilizing Activations for Enhanced Generalization* AI Research Day, Institute for Artificial Intelligence (Athens, GA, USA). Apr. 2024.

P4. *Modified Likelihood Ratio Tests for Extreme Value Distributions* The Korean Statistical Society (Pusan National University, Busan, South Korea). May 2018.

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