

# Soo Min Kwon

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## CONTACT INFORMATION

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## EDUCATION

### University of Michigan

Ann Arbor, MI

Ph.D., Electrical Engineering and Computer Science

Sept. 2022 – May 2026 (Expected)

- Thesis: “Deep Learning through Low-Dimensional Representations: Theory and Algorithms”
- Advisors: Prof. Laura Balzano and Prof. Qing Qu

### Rutgers University

New Brunswick, NJ

M.S., B.S., Electrical and Computer Engineering

Sept. 2020 – May 2022

- Advisor: Prof. Anand D. Sarwate
- Minor: Mathematics

## WORK EXPERIENCE

### Student Researcher

Aug. 2025 – Nov. 2025



New York, NY

- Developed Hybrid-GRPO, a reinforcement learning algorithm that accelerated large-scale policy model training by 18%; demonstrated its efficiency on models up to 8B parameters in complex reasoning and mathematical tasks
- Validated the additional effectiveness of Hybrid-GRPO by showing improved performance on 1B-parameter language models compared to existing baselines

### Applied Scientist Intern

Aug. 2024 – Nov. 2024



Seattle, WA

- Developed a causal inference framework using deep learning methods for the SCOT team that reduced variance estimates by over 10%

### Applied Research Data Science Intern

May 2022 – Aug. 2022



LinkedIn Corporation

Sunnyvale, CA

- Productionized a machine learning pipeline for the infrastructure team, reducing MAPE by over 15% in forecasting hardware needs for the next calendar year

## PUBLICATIONS

(† EQUAL CONTRIBUTION)

- [1] **S. M. Kwon**<sup>†</sup>, A. S. Xu<sup>†</sup>, C. Yaras, L. Balzano, Q. Qu. “Out-of-Distribution Generalization of In-Context Learning: A Low-Dimensional Subspace Perspective”. In *Neural Information Processing Systems (NeurIPS) Workshop on What Can’t Transformers Do?*, 2025; DeepMath, 2025 (**Oral**). [[Online](#)]
- [2] A. Ghosh<sup>†</sup>, **S. M. Kwon**<sup>†</sup>, R. Wang, S. Ravishankar, Q. Qu. “Learning Dynamics of Deep Matrix Factorization Beyond the Edge of Stability”. In *International Conference on Learning Representations (ICLR)*, 2025. [[Online](#)]
- [3] C. Lee, **S. M. Kwon**, Q. Qu, H. Lee. “BLAST: Block-Level Adaptive Structured Matrices for Efficient Deep Neural Network Inference.” In *Neural Information Processing Systems (NeurIPS)*, 2024. [[Online](#)]
- [4] **S. M. Kwon**, L. Ding, L. Balzano, Q. Qu. “On the Relationship Between Small Initialization and Flatness in Deep Networks.” In *International Conference on Learning Representations (ICLR) Workshop on Bridging the Gap Between Practice and Theory in Deep Learning*, 2024.
- [5] **S. M. Kwon**, Z. Zhang, D. Song, L. Balzano, Q. Qu. “Efficient Compression of Overparameter-

ized Deep Models.” In *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2024. [[Online](#)]

- [6] B. Song<sup>†</sup>, **S. M. Kwon<sup>†</sup>**, Z. Zhang, X. Hu, Q. Qu, L. Shen. “Solving Inverse Problems with Latent Diffusion Models via Hard Data Consistency.” In *International Conference on Learning Representations (ICLR)*, 2024 (**Spotlight, Top 5%**). [[Online](#)]
- [7] D. K. Saha, V. Calhoun, **S. M. Kwon**, A. D. Sarwate, R. Saha, S. Plis. “Federated, Fast, and Private Visualization of Decentralized Data”. In *International Conference on Machine Learning (ICML) Workshop on Federated Learning*, 2023. [[Online](#)]
- [8] **S. M. Kwon**, X. Li, A. D. Sarwate. “Low-Rank Phase Retrieval with Structured Tensor Models.” In *International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2022. [[Online](#)]
- [9] D. K. Saha, V. D. Calhoun, Y. Du, Z. Fu, R. Panta, **S. M. Kwon**, A. D. Sarwate, S. M. Plis. “Privacy-Preserving Quality Control of Neuroimaging Datasets in Federated Environments”. In *Organization for Human Brain Mapping (OHBM)*, 2021. [[Online](#)]
- [10] **S. M. Kwon**, A. D. Sarwate. “Learning Predictors from Multidimensional Data with Tensor Factorizations”. In *Rutgers University Aresty Undergraduate Research Journal*, 2021. [[Online](#)]
- [11] **S. M. Kwon**, S. Yang, J. Liu, X. Yang, W. Saleh, S. Patel, C. Mathews, Y. Chen. “Hands-Free Human Activity Recognition Using Millimeter-Wave Sensors”. In *IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, 2019. [[Online](#)]

#### PREPRINTS

- [1] **S. M. Kwon<sup>†</sup>**, A. S. Xu<sup>†</sup>, C. Yaras, L. Balzano, Q. Qu. “Out-of-Distribution Generalization of In-Context Learning: A Low-Dimensional Subspace Perspective”. Submitted to *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2026. [[Online](#)]
- [2] L. Balzano, T. Ding, B. D. Haeffele, **S. M. Kwon**, Q. Qu, P. Wang, Z. Wang, C. Yaras. “An Overview of Low-Rank Structures in the Training and Adaptation of Large Models”. Submitted to *IEEE Signal Processing Magazine*, 2025 ( $\alpha$ - $\beta$  Order). [[Online](#)]
- [3] **S. M. Kwon<sup>†</sup>**, C. Blocker<sup>†</sup>, H. Raja, J. Fessler, L. Balzano. “Dynamic Subspace Estimation from Undersampled Data using Grassmannian Geodesics”. Submitted to *Transactions on Machine Learning Research (TMLR)*, 2025.
- [4] X. Li, **S. M. Kwon**, I. Alkhouri, S. Ravishankar, Q. Qu. “Decoupled Data Consistency for Solving General Inverse Problems with Diffusion Models.” Submitted to the *IEEE Journal of Selected Topics in Signal Processing (JSTSP)*, 2025. [[Online](#)]

#### AWARDS & HONORS

Harvey G. and Joyce H. Behner Graduate Fellowship	2024
University of Michigan PhD Rackham Merit Fellowship	2023
Rutgers ECE Outstanding Master’s Student Award	2022
Rutgers ECE Outstanding Teaching Assistant Award	2021
Rutgers ECE Departmental Leadership & Service Award	2020
Rutgers WINLAB GA/TA Grant	2020 – 2020
Rutgers University Dean’s List	2018 – 2020

#### INVITED TALKS

2025 INFORMS Annual Meeting	2025
Math Machine Learning Seminar @ MPI MIS + UCLA	2025

#### REVIEWER SERVICE

International Conference on Learning Representations (ICLR)	2026
Neural Information Processing Systems (NeurIPS)	2025

International Conference on Machine Learning (ICML)	2024
Neural Information Processing Systems (NeurIPS) Workshop on Diffusion Models	2023
Conference on Parsimony and Learning (CPAL)	2024
Neural Information Processing Systems (NeurIPS)	2024