Minji Kim

Last updated in October 2024

mkim5@unc.edu mjkim1001.github.io mjkim1001 mjkim1001

Education

Ph.D. in Statistics and Operations Research, University of North Carolina at Chapel Hill (UNCCH) — *Chapel Hill, NC*
- Advisor: Dr. Vladas Pipiras — *Aug 2021 – May 2026*

M.S. in Statistics, Seoul National University (SNU) — *Seoul, South Korea*
- Advisor: Dr. Hee-Seok Oh — *Mar 2019 – Feb 2021*

B.S. in Statistics, Minored in Computer Science and Engineering, Seoul National University (SNU) — *Mar 2015 – Feb 2019*

Research Experience

Summary solid background in statistical ML and hands-on experience in physics simulations, with AI research focused on spatio-temporal PDE solutions, including reduced-order modeling and handling boundary conditions via approximate distance fields.

Multi-fidelity modeling (UNCCH) developed statistical methods to leverage multiple computer models of varying fidelities, including 3+ works on calibration, importance sampling and ensemble estimators (a semi-supervised learning for partially labeled data.)

Physics-informed Neural Networks (UNCCH) reduced order modeling for approximating parametrized (spatio-temporal) PDE solutions conditionally on low-dimensional latent states, leveraging coordinate-based NNs and Neural ODEs using **PyTorch** and **python**.

Spatio-temporal analysis of particular matter (SNU) forecast and missing data imputation via dynamic factor model and EM algorithm.

Zero-inflated Time-series clustering (SNU) applied to 1440-dimensional step count data from wearable devices and COVID-19 data.

Work Experience

Moloco, Software Engineer Research Intern — *Seattle, WA*
- Extracted and analyzed large-scale data using **SQL** to simulate and infer outcomes. — *May 2022 – Aug 2022*
- Researched on exploration strategies and distribution shifts for real-time bidding price prediction models for online ads.

Lawrence Livermore National Laboratory (LLNL), NSF Mathematical Sciences Graduate Intern — *remote, Livermore, CA*
- Contributed to *libROM*, a lightweight, scalable **C++** library for nonlinear dynamical problems. — *May 2021 – Jul 2021*
- Gained hands-on experience with data-driven large-scale physics simulation codes utilizing MPI-based parallel computing.

Publications

S. Cheung et al., 'Survey on quadrature point selection in hyper-reduced order models for finite element methods' (In prep).

M. Kim, B. Brown, V. Pipiras, 'Parametric multi-fidelity Monte Carlo estimation with applications to extremes', submitted.

M. Kim, T. Wen, K. Lee, Y. Choi, (2024), 'Physics-informed reduced order model with conditional neural fields', *NeurIPS 2024 Workshop on Machine Learning and the Physical Sciences* (to appear). **keywords: implicit neural representation, approximate distance field**

M. Kim, K. O'Connor, V. Pipiras, T. Sapsis, (2024+), 'Sampling low-fidelity outputs for estimation of high-fidelity density and its tails', *SIAM/ASA Journal on Uncertainty Quantification* (to appear). **keywords: importance sampling, extreme value theory**

M. Kim, V. Pipiras, T. Sapsis. (2024), 'Statistical Reduced-Order Modeling of Peaks of Vertical Bending Moment in Irregular Waves', *Proceedings of the 35th Symposium on Naval Hydrodynamics (SNH)*, Nates, France. **keywords: importance sampling**

M. Kim, V. Pipiras, A. Reed, K. Weems, (2023), 'Calibration of low-fidelity ship motion programs through regressions of high-fidelity forces', *Ocean Engineering* **290**, 116321. **keywords: reduced-order model, penalized regression**

M. Kim, H. Oh, and Y. Lim, (2023), 'Zero-Inflated Time-Series Clustering Via Ensemble Thick-Pen Transform', *Journal of Classification* **40**, 407–431. **keywords: step count from wearable device, COVID-19 data**

Selected Honors and Awards

- **SIAM and UNCCH Travel Awards (2024)** for attending the SIAM UQ24 conference.
- **Cambanis-Hoeffding-Nicholson Award (2022)** UNCCH, for outstanding academic performance in first-year doctoral program.
- **NSF Mathematical Sciences Graduate Internship (2022, $12,000)** Oak Ridge Institute for Science and Education.
- **Korean Government Scholarship for Overseas Study (2021, $80,000)** Korean Government, 5 students in the Intelligent Infrastructure field selected nationwide for a doctoral study abroad program.
- **The Presidential Science Scholarship (2015, Tuitions and incentives)** Top national scholarship for outstanding STEM students.

Teaching Experience

Instructor: STOR 155 Introduction to Data Models and Inference (2024F, UNCCH)

Teaching Assistant: Introduction to Deep Learning (2022Sp, UNCCH), Methods of Data Analysis (2022Sp, 2021F, UNCCH), Sampling Design and Survey (2020F, SNU), Design and Analysis of Experiments (2020Sp, SNU), Lab (2020Sp, 2019F, SNU)

Technologies

Languages: Julia, R, Python, C++, C, Java, SQL. **Development Tools:** Git, Linux, Bash, LaTeX, slurm, CUDA.
Machine Learning: PyTorch, TensorFlow, scikit-learn, glmnet. **Data Analysis:** dplyr, NumPy, ggplot2, Matplotlib, Seaborn.