Seungjun Lee

Email: slee19@bnl.gov
LinkedIn: seungjun-lee-656946213
GitHub: github.com/7tl7qns7ch

Research Interests

My research goal is to develop artificial general intelligence having the ability to think in a scientific way. It is common in fields of science and engineering that a well-established governing rule can explain similar phenomena, not just fitting on data from a narrow domain. Therefore, it is more scientifically important, and at the same time very challenging, to develop a general model that can explain many related phenomena rather than a narrow model. In the field of machine learning, such discussions are considered very important problems, and I am enthusiastic about the study of approaching and applying learning-based models and algorithms from a scientific modeling perspective.

Education & Career History

Brookhaven National Laboratory   Upton, New York
Research Staff in Computer Science Initiative   2025–Present

Brookhaven National Laboratory   Upton, New York
Research Associate in Computer Science Initiative   2024–2025

Alsemy   Seoul, Korea
AI Researcher   2022–2024

Seoul National University   Seoul, Korea
Ph.D. in Naval Architecture and Ocean Engineering (Prof. Woojae Seong)   2017–2022

Seoul National University   Seoul, Korea
B.S. in Naval Architecture and Ocean Engineering   2012–2017

Hansung Science High School   Seoul, Korea
Student   2009–2012

Publications

1. Minju Jo, Woojin Cho, Uvini Balasuriya Mudiyanselage, **Seungjun Lee**, Noseong Park, Kookjin Lee, "PDEfuncta: Spectrally-Aware Neural Representation for PDE Solution Modeling", *Advances in Neural Information Processing Systems, 2025.*

2. David Keetae Park, Xihaier Luo, Guang Zhao, **Seungjun Lee**, Miruna Oprescu, and Shinjae Yoo, "SCENT: Robust Spatiotemporal Learning for Continuous Scientific Data via Scalable Conditioned Neural Fields", *International Conference on Machine Learning, 2025.*

3. Guang Zhao, Xihaier Luo, **Seungjun Lee**, Yihui Ren, Shinjae Yoo, Luke Van Roekel, Balu Nadiga, Sri Hari Krishna Narayanan, Yixuan Sun, and Wei Xu, "Generalizable Implicit Neural Representations via Parameterized Latent Dynamics for Baroclinic Ocean Forecasting", *International Conference on Learning Representations Workshop on Tackling Climate Change with Machine Learning, 2025.*

4. Chanwoo Park, **Seungjun Lee**, Junghwan Park, Kyungjin Rim, Jihun Park, Seonggook Cho, Jongwook Jeon, and Hyunbo Cho, "Large-Scale Training in Neural Compact Models for Accurate and Adaptable MOSFET Simulation", *IEEE Journal of the Electron Devices Society, 2024.*

5. **Seungjun Lee**, and Tail Oh, "Inducing Point Operator Transformer: A Flexible and Scalable Architecture for Solving PDEs", *AAAI Conference on Artificial Intelligence, 2024.*

6. **Seungjun Lee**, "Mesh-Independent Operator Learning for Partial Differential Equations", *International Conference On Machine Learning Workshop on AI for Science, 2022.*

7. **Seungjun Lee**, Haesang Yang, and Woojae Seong, "Identifying Physical Law of Hamiltonian Systems via Meta-Learning", *International Conference on Learning Representations, 2021.*

8. **Seungjun Lee**, Haesang Yang, Hwiyong Choi, and Woojae Seong, "Zero-Shot Single-Microphone Sound Classification and Localization in a Building via the Synthesis of Unseen Features", *IEEE Transactions on Multimedia, 2021.*

9. **Seungjun Lee**, and Woojae Seong, "Meta-Learned Hamiltonian", *Neural Information Processing Systems Workshop on Machine Learning and Physical Sciences, 2020.*

10. Hwiyong Choi, Haesang Yang, **Seungjun Lee**, and Woojae Seong, "Type/position classification of inter-floor noise in residual buildings with a single microphone via supervised learning", *IEEE European Signal Processing Conference, 2020.*

11. Haesang Yang, Hwiyong Choi, **Seungjun Lee**, and Woojae Seong, "A Learning-based Classification of Indoor Noise Type/Position in an Apartment Building", *Acoustical Society of America, 2019.*

12. Hwiyong Choi, Haesang Yang, **Seungjun Lee**, and Woojae Seong, "Classification of Inter-Floor Noise Type/Position Via Convolutional Neural Network-Based Supervised Learning", *Applied Science, 2019.*

13. Hwiyong Choi, Haesang Yang, **Seungjun Lee**, and Woojae Seong, "Classification of Inter-Floor Noise Type/Position via Supervised Learning", *Acoustical Society of America, 2019.*

14. Hwiyong Choi, **Seungjun Lee**, Haesang Yang, and Woojae Seong, "Classification of Noise Between Floors in a Building using Pre-Trained Deep Convolutional Neural Networks", *International Workshop on Acoustic Signal Enhancement, 2018.*

SERVICE

- **Conference Reviewer:** ICLR (2025, 2026), ICML (2025), Neurips (2025), AAAI (2026), TMLR (2025)

SKILLS

- Python, PyTorch, JAX, Tensorflow, MATLAB, Julia, LATEX, SPICE

PROJECTS

- **Generative AI for particle physics**   2025.10 –2026.09
  Main content: Develop and evaluate AI-based surrogate models for fast spatiotemporal hydrodynamic simulations to accelerate physical modeling and prediction.

  - Evaluate performance of multiple AI model architectures for multi-dimensional quark-gluon-plasma simulations

  - Validate surrogate model outputs by comparing them against results from standard hydrodynamic simulations.

  - Extend the model evaluation to high-dimensional hydrodynamic simulations, testing scalability and stability.

- **Developing a generative models for ptychography**   2025.01 –2026.09
  Main content: Develop and apply a diffusion-based generative model for solving the inverse problem of ptychography. The goal is to generate high-quality reconstructions of the target phase of the materials.

  - Obtain diffusion model results using real experimental diffraction data, including preprocessing and postprocessing to make results physically plausible.

  - Collaborate with domain scientists to analyze the results from the diffusion-based inverse solver.

- **Developing foundation models for gamma spectra** 2024.10 –2025.09
  Main content: Developing a robust and computationally efficient Transformer to learn gamma spectra data.
- **Developing ocean foundation models for forecasting the ocean circulation** 2024.09 –2024.12
  Main content: Developing a robust and efficient foundation model to analyze and forecast Atlantic meridional overturning circulation.
- **Developing efficient architecture for solving physical systems** 2022.09 –2024.02
  Main content: Developing a flexible and computationally efficient Transformer to learn physical systems handling continuous functions.

  - Proposing a Transformer that is flexible in handling arbitrary discretization and scalable to large discretization sizes.

  - Handling arbitrary input/output discretization by processing them in the latent space to avoid quadratic complexity.

  - Achieving high accuracy and efficient computational costs in several PDE benchmarks and real-world scenarios.

- **Developing robust physics-based neural networks for analyzing dynamic systems** 2021.03 –2022.08
  Main content: Proposing a method using meta-learning algorithms to model governing equations from similar dynamical systems, enabling rapid learning for new systems even with limited measurement data.

  - Using a meta-learning algorithm to extract governing rules across similar dynamical systems.

  - Using Neural ODEs and the Hamiltonian equations to continuously model dynamical systems and utilize the energy conservation principle.

  - Simulating various systems with different physical properties and initial conditions and validating the capability to efficiently learn new systems even with limited data.

- **Learning-based sound source classification and localization with limited data** 2019.03 –2021.02
  Main content: Developing a generative model to robustly estimate the position of sound sources, even from unseen locations within a building during the training.

  - Applying Zero-shot learning techniques to the problem of sound classification and localization, involving simultaneously classifying the type and location of sound sources.

  - Using a conditional GAN to map sound data to their corresponding types and locations of sound sources and to augment data for unseen locations.

  - Collecting extensive real-world environment sound datasets, including various types and locations, to develop a robust sound generative model.

AWARDS

- [BK] Education Research Group selected excellent graduate students 2022
- Korean Mathematical Olympiad (high school) - bronze prize 2010
- Korean Mathematical Olympiad (middle school) - gold prize 2008
- Korean Physics Olympiad (middle school) - silver prize 2007
- Korean Mathematical Olympiad (middle school) - silver prize 2006

TEACHING

- **Teaching Assistant** at Seoul National University Fall 2021
  Theory of Sound Wave Propagation in the Ocean
- **Teaching Assistant** at Seoul National University Spring 2021
  Fundamentals of Underwater Acoustics
- **Teaching Assistant** at Seoul National University Spring 2020
  Creative Experiments in Naval Architecture and Ocean Engineering
- **Teaching Assistant** at Seoul National University Fall 2019
  Creative Experiments in Naval Architecture and Ocean Engineering