Jaewan Park

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Research Interests

Agentic AI, Foundation Models, and Neural Operators for Scientific Discovery

- **Towards Autonomous AI Scientists:** Training RL-driven LLM agents capable of hypothesis generation, verification, and zero-shot synthesis of complex PDE solvers.
- **Efficient Adaptation of Foundation Models:** Designing model-agnostic frameworks for downstream tasks and efficient finetuning that transfer across diverse domains, with a strong emphasis on spatiotemporal fluid dynamics and multi-physics foundation models.

Education

University of Illinois Urbana-Champaign *Aug 2022 –*
PhD student in Mechanical Science and Engineering
Focus: Generative AI, Foundation Models, and Representation Learning in PDEs

- GPA: 3.61 / 4.0
- **Coursework:** Graph Machine Learning, Diffusion Flow Matching Models, Statistical Learning Theory

Pohang University of Science and Technology (POSTECH), South Korea *Mar 2016 – June 2020*
B.S. in Mechanical Engineering - Summa Cum Laude (Rank : 1)

- GPA: 4.02 / 4.3 (3.89 / 4.0)

Stanford University, CA, US *June 2019 – Aug 2019*
International Honors Student

- GPA: 3.914 / 4.0

Publications

Stabilizing Autoregressive PDE Foundation Model Rollouts with Event-Triggered Context Healing Sep 2026
Jaewan Park, J Yoo, K Kobayashi, S Koric, SB Alam, I Jasiuk, S Chakraborty, D Abueidda
SC26 proceedings

Bridging sequential deep operator network and video diffusion: Residual refinement of spatio-temporal pde solutions Jul 2026
Jaewan Park, F Ahmed, K Kobayashi, S Koric, SB Alam, I Jasiuk, D Abueidda *Under Review*
arxiv:2507.06133

Network architecture follows coupling in multiphysics systems: single vs. multiple branches in DeepONet and S-DeepONet Jan 2026
Jaewan Park, K Kobayashi, Q Liu, S Koric, D Abueidda, SB Alam
Communications Engineering

Sequential deep operator neural networks for plastic and thermo-viscoplastic transient material behavior Aug 2025
Jaewan Park, K Kobayashi, Q Liu, AA Koric, D Abueidda SB Alam, S Koric
International Journal of Plasticity

Nonlinear Inverse Design of Mechanical Multi-Material Metamaterials Enabled by Video Denoising Diffusion and Structure Identifier Jan 2025
Jaewan Park, S Kushwaha, J He, S Koric, Q Liu, I Jasiuk, D Abueidda
Engineering Applications of Artificial Intelligence

Predictions of transient vector solution fields with sequential deep operator network Aug 2024

J He, S Kushwaha, ***Jaewan Park***, S Koric, D Abueidda, I Jasiuk
Acta Mechanica

Advanced deep operator networks to predict multiphysics solution fields in materials processing and additive manufacturing May 2024

S Kushwaha*, ***Jaewan Park***, S Koric, J He, I Jasiuk, D Abueidda
* Co-first authors.
Additive Manufacturing

Sequential deep operator networks (s-deeponet) for predicting full-field solutions under time-dependent loads Jan 2024

J He, S Kushwaha, ***Jaewan Park***, S Koric, D Abueidda, I Jasiuk
Engineering Applications of Artificial Intelligence

Novel DeepONet architecture to predict stresses in elastoplastic structures with variable complex geometries and loads Oct 2023

J He, S Koric, S Kushwaha, ***Jaewan Park***, D Abueidda, I Jasiuk
Computer Methods in Applied Mechanics and Engineering

Ongoing Projects

Agentic reinforcement learning for automated PDE code generation *In preparation*

- Training an LLM agent and shaped outcome rewards to synthesize executable finite-element solver code directly from PDE specifications.
- Generated new data for train & evaluation for multiple types of libraries (FEM, FVM, Spectral, Discontinuous Galerkin), established a failure-clustering analysis pipeline.

Benchmarking and Out-of-Distribution (OOD) Generalization for Fluid Dynamics Foundation Models *In preparation*

- Developing a comprehensive benchmarking framework to evaluate the trustworthiness and generalization of PDE foundation models on large-scale Computational Fluid Dynamics (CFD) datasets.
- Formulating rigorous OOD definitions and physical validation metrics to stress-test model robustness across unseen spatiotemporal fluid regimes.

Generative Style Transfer for Histopathology with Retrieval-Augmented Flow Matching *In preparation*

- Unpaired H&E-to-IHC translation via Vision Language Model and Optimal using Histopathology Foundation Models, achieving high-fidelity generation with semantic consistency.

Talks & Posters

SC26 *Chicago, IL*
Stabilizing Autoregressive PDE Foundation Model Rollouts with Event-Triggered Context Healing *Nov 2026*

NCSA student research conference *Urbana-Champaign, IL*
Transformer based neural operators for real-time accurate prediction *Apr 2026*

NCSA student research conference *Urbana-Champaign, IL*
Multi-material lattice design with diffusion models *Apr 2025*

NCSA student research conference *Urbana-Champaign, IL*
Multiphysics with operator networks: Towards Additive Manufacturing *Apr 2024*

Technical Skills & Systems (Selected)

ML & Optimization: PyTorch, Hugging Face Diffusers/Accelerate/Transformers, LoRA/QLoRA, vLLM
Scientific Computing: Operator learning, FEniCSx, Abaqus, Ansys
Experimentation: Hydra-based automation, Weights & Biases, Git

Systems & HPC: Linux, Bash, SLURM (job arrays), CUDA/cuDNN, conda/mamba, Docker/Apptainer
Language: Python, C, C++, R

Teaching & Mentoring

Teaching Assistant — TAM 210/211 (Statics) *Urbana–Champaign, IL*
Jan 2023 – May 2023