Hong Chul Nam

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Education

ETH Zurich — Zurich, Switzerland
Master of Science in Electrical Engineering and Information Science — *Jan 2022 – June 2026*

California Institute of Technology — Pasadena, USA
Visiting Researcher — *Oct 2023 – Sept 2024*

ETH Zurich — Zurich, Switzerland
Bachelor of Science in Electrical Engineering and Information Science — *Sep 2018 – Sep 2023*

St. Anselm's Abbey School — Washington DC, USA
High School — *Sep 2014 - Sep 2016*

Experience

AI Research Engineer — Dec 2025 – Present
Zenithon AI — *Remote*

- One of AI researchers working on building a foundation model for plasma physics using transformer-based neural operators to accelerate physical simulation of nuclear fusion
- Exploring diverse transformer architectures in LLM and introducing efficient KV caching for transformer operators

AI Researcher — Oct 2024 – Present
Korea Military Academy — *Seoul, Republic of Korea*

- Supervisor: Sunil Hwang, Prof. Hyun Kwon
- Mandatory military service (1.5 years)
- Participated (top 2 out of 270 teams) in the public competition for AI-based automatic document generation using VLM for in-home elder care work
- Built an autonomous surveillance system using real-time object detection with VLM for the Korean army
- Achievements: publication in CoRL Workshop 2025, second-place in competition for document automation for in-home elder care works

Student Researcher — Oct 2023 – Present
Anima's Lab, California Institute of Technology — *Pasadena, USA*

- Funding: Caltech Research Funding
- Supervisor: Dr. Julius Berner, Dr. Xi Deng, Prof. Anima Anandkumar
- Solved high-dimensional Poisson equations using stochastic reformulation via Walk-on-Spheres (WoS) and neural network in a general framework called Neural Walk-on-Spheres (NWoS)
- Extending self-supervised learning methods (VICReg, MAE, JEPA) to functions with neural operators
- Collaborating with researchers from NVIDIA, University of Chicago, Argonne National Laboratory and Caltech to improve weather modeling with self-supervised learning
- Collaborating with a researcher from Purdue University to extend Neural Walk-on-Spheres (NWoS) to neural operators (WoS-NO)
- Co-supervising a student on neural operator learning for path planning via screened Poisson equations and WoS.
- Generalizing random walk schemes on training data generated from expensive mesh-based solvers for learning transition kernel (i.e. Green's function) to enable generalization of stochastic solvers into nonlinear PDEs
- Achievements: publication in ICML 2024, submission to ICLR 2026

AI Researcher — Jan 2022 – Dec 2024
Alsemy Inc. — *Seoul, Republic of Korea*

- Supervisor: Chanwoo Park, Dr. Ye Sle Cha, Dr. Jongwook Jeon, Hyunbo Cho
- Accelerated modeling of variability in transistor devices under process variations using generative models and importance sampling
- Implemented neural operator-based foundation models and reinforcement learning methods for transistor device modeling and circuit optimization
- Created the first function-level anomaly detection neural operator for detecting anomaly device simulations
- Created the device simulation augmentaion method by training function-level autoencoder and latent diffusion model to improve diversity of large-scale training data
- Proposed a neural ODE-based compact model for transient self-heating simulation of transistor devices
- Achievements: publications in SISPAD 2023/2024, NeurIPS 2023 Workshop, ICMC 2025, IEEE Electron Device Letters Submission; full simulation pipeline for variability analysis, DTCO, anomaly detection and self-heating

Research Assistant Sep 2021 – Jul 2023
SAFARI Lab, ETH Zurich *Zurich, Switzerland*

- Supervisor: Konstantinos Kanellopoulos, Prof. Onur Mutlu
- Created a neural network-based page table walk cost estimator to selectively place evicted L2 TLB page tables into L2 data cache
- Introduced Merkle trees in page tables to enforce efficient security checks during each intermediate walk of page table walks to verify the integrity of page tables under security attacks
- Contributed to CUDA programming introductory codes for a heterogeneous computing course
- Achievements: publication in MICRO 2023; extension of SniperSim to support neural network; extension of Gem5 and SniperSim to support Merkle trees in page tables

Research Intern Sep 2021 – Apr 2022
Swiss Center for Electronics and Microtechnology (CSEM) *Zurich, Switzerland*

- Supervisor: Dr. Andrea Bonetti
- Developed a low-power MFCC feature extractor using SystemVerilog with UVM verification for a speech signal AI accelerator
- Explored structural changes in hardware as well as neural network architecture for achieving ultra-low power consumption
- Achievements: implementation of MFCC module in SystemVerilog code with verification; optimization of hardware/software implementation of the block

Research Engineer Sep 2020 – Sep 2021
ASL Lab, ETH Zurich *Zurich, Switzerland*

- Funding: Swiss military, ETH Zurich
- Supervisor: David Rohr, Dr. Nicholas RJ Lawrance, Prof. Roland Siegwart
- Developed an autonomous firefighting VTOL drone for wildfire surveillance from scratch
- Achievements: development of VTOL drone with surveillance system

Research Assistant Jun 2015 – Jul 2015
Vanderver Laboratory, Children's National Hospital *Washington DC, USA*

- Funding: Summer internship stipend
- Supervisor: Dr. Asako Takanohashi, Prof. Adeline Vanderver
- Worked on Aicardi Goutieres Syndrome using PCR, cell culture, western blot, and immunohistochemistry approaches
- Achievements: learning cellular biology and all techniques for growing cells and treating drugs

Projects

Self-supervised Learning for Few-Step Models Jun 2025 – Present

- Collaborator: Sunil Hwang, Junseob Kim, Jaehyeong Jo
- Quantifying the loss of sample diversity in few-step models such as the consistency model and meanflow
- Introducing semantic information with alignment to improve the diversity

Debiasing the Classifier-Free Guidance due to Nulltoken Dec 2024 – Present

- Collaborator: Joochul Lee
- Proved quantitatively the bias in probability distributions due to null token for approximating the unconditional distribution in conditional flow matching models and working on removing the bias

Q-Guided Flow Q-Learning Dec 2024 – Sep 2025

- Supervisor: Prof. Hyun Kwon
- Developed a decoupled actor–critic framework combining flow-based policy learning and value-guided correction for stable and expressive offline reinforcement learning

Continuous Control of Robot Arm Jan 2023 – Jun 2023

- Supervisor: Bhavya Sukhija, Lenart Treven, Prof. Andreas Krause
- Implemented robot API for RL in the real world for the UR5 robot
- Implemented and tested offline model based RL methods on the robot
- Achievements: implemented software interface to control UR5 robot arm; verified RL methods in the robot

Autonomous Driving Mini-car Sep 2020 – Jan 2021

- Supervisor: Dr. Michele Magno, Prof. Luca Benini
- Developed a real-time autonomous driving model using a Sony microcontroller and an RC car with external camera modules for CNN-based lane detection
- Achievements: demonstrated the highly accurate and functional autonomous driving system with Sony microcontrollers using CNN-base architectures

Publications

- Hrishikesh Viswanath*, **Hong Chul Nam***, Julius Berner, Anima Anandkumar, Aniket Bera. "Operator Learning with Weak Supervision from Walk-on-Spheres". Submission: International Conference on Learning Representations (ICLR 2026)
- Yejun Jang*, **Hong Chul Nam***, Jeong Min Park*, Gimin Bae, Hyun Kwon. "Q-Guided Flow Q-Learning". In: CoRL 2025 Workshop RemembeRL
- Eunki Joung*, **Hong Chul Nam***, Hyun Kwon. "CARE FISH: An LLM-based Case Document Generation System for Careful Case Work". Submission: *In preparation*
- Hrishikesh Viswanath, **Hong Chul Nam**, Julius Berner, Anima Anandkumar, Aniket Bera. "Gradient-Free Physics-Informed Operator Learning with Walk-on-Spheres". In: NeurIPS 2025 AI for Science Workshop
- Premkumar Vincent*, Yeongwoo Nam*, Kyungmin Kim*, **Hong Chul Nam**, Hyunseok Whang, Donghyun Jin, Jongwook Jeon, Chang-Sub Lee, Jihun Park, Ye Sle Cha, Hyunbo Cho. "Large Pre-trained Model Approach for Efficient Design Technology Co-Optimization". **(Oral)** In: International Compact Modeling Conference 2025 (ICMC 2025).
- **Hong Chul Nam***, Tae Il Oh*, Ye Sle Cha, Jongwook Jeon, Hyunbo Cho. "FuncFlow: A Generative Neural Operator Using Diffusion Model for Simulation Augmentation". **(Oral)** In: International Compact Modeling Conference 2025 (ICMC 2025).
- **Hong Chul Nam***, Julius Berner*, Anima Anandkumar. "Solving Poisson Equations using Neural Walk-on-Spheres". In: Forty-first International Conference on Machine Learning (ICML 2024).
- Tae Il Oh*, **Hong Chul Nam***, Chanwoo Park, Hyunbo Cho. "FuncAnoDe: A Function Level Anomaly Detection in Device Simulation". **(Oral)** In: International Conference on Simulation of Semiconductor Processes and Devices (SISPAD 2024).
- Konstantinos Kanellopoulos, **Hong Chul Nam**, Nisa Bostanci, Rahul Bera, Mohammad Sadrosadati, Rakesh Kumar, Davide Basilio Bartolini, Onur Mutlu. "Victima: Drastically Increasing Address Translation Reach by Leveraging Underutilized Cache Resources". In: Proceedings of the 56th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO 2023).
- Chanwoo Park*, **Hong Chul Nam***, Jihun Park, Jongwook Jeon. "FlowSim: An Invertible Generative Network for Efficient Statistical Analysis under Process Variations". **(Oral)** In: International Conference on Simulation of Semiconductor Processes and Devices (SISPAD 2023).
- **Hong Chul Nam**, Chanwoo Park. "NPC-NIS: Navigating Semiconductor Process Corners with Neural Importance Sampling". In: NeurIPS 2023 Workshop on Adaptive Experimental Design and Active Learning in the Real World.

Awards

Second place (top 2 / 270 teams): Competition for in-home elder social care (Aug 2025)
Third place: Defense Technology Startup Competition, Korean Army (May 2025)
Fourth place: Army Startup Competition (Mar 2025)

Technical/Linguistic Skills

Linguistics: English, Mandarin, Korean, German
Languages: Java, Python, C/C++, Verilog/SystemVerilog
ML Libraries: PyTorch, TensorFlow, JAX
Computer Simulators: Gem5, SniperSim

Reviewing

- ICLR 2026
- NeurIPS 2025