Seoyeong Hwang

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AI Researcher | Graph Learning for Physical Systems & LLM Agents

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About

I model physical systems with graph learning, and I ship LLM products end to end.

- **Graph learning.** GNN surrogate for contact simulation (M.S. thesis; lowest RMSE among compared methods, physics terms −41.2%) and an 11-model EV-demand forecasting benchmark.
- **LLM agents.** Sole engineer of a multi-agent tutoring app shipped to TestFlight in under 17 weeks; prototyped bandit-based question selection and compared IRT models.
- **Track record.** 5 papers (IEEE Access + 3 conferences, 2 orals + 1 preprint), 2 patent applications, 2 software copyrights.

Education

MS **Ewha Womans University**, Artificial Intelligence & Software — Mar 2024 – Feb 2026
GPA 4.02 / 4.3 | Advisor: Prof. Junhyug Noh
Thesis: *Bio-Adaptive MeshGraphNet for High-Fidelity Foot Deformation Prediction under Ground Contact*

BS **Ewha Womans University**, Chemistry & Nano Science / Brain & Cognitive Sciences — Mar 2018 – Feb 2024
Double major | GPA 3.63 / 4.3

Industry Experience

VStdy (education-technology startup) — Apr 2026 – Aug 2026
Founding AI Engineer (independent contractor) — Remote

- **Sole engineer** all 69 commits across app, backend and web; TestFlight build 22 in under 17 weeks
- **Multi-agent tutor** 10-handler state machine coordinating 6 specialist agents (LangChain, LangSmith)
- **Video pipeline** unattended Manim batch (AST lint, ±2 s gate, LLM repair) for all 80 practice problems
- **Reliability** deterministic on-device answer graders; second-LLM verification gate for scans

MathLab-AI, LLC (KAIT adaptive-learning platform) — Jan 2026 – Mar 2026
AI Engineer (independent contractor) — Remote

- **Question selection** LinUCB contextual bandit prototyped on simulated learners (not deployed)
- **IRT study** 1PL–4PL, MIRT, DeepIRT, item-graph GNN with up to 56% masked; 1PL/4PL most robust (AUC 0.771)
- **Debugging** traced the IRT recommendation workflow through database structures and service logic

Research Experience

Empact Labs Co., Ltd. — Jun 2025 – Jul 2026
AI Research Intern (fixed-term contract) — Seoul

- **Benchmark** 11 spatio-temporal forecasters (GNN, Transformer) in one suite; 33 jobs across 3 EV-charging targets
- **Best MAE, Seongnam** energy 6.86 kWh and occupancy 0.022 (DCRNN); arrivals 0.991 (D2STGNN)
- **Failure triage** traced all 5 failed runs to implementation or numerical-stability causes

Human Performance Lab Co., Ltd. — Jan 2025 – Feb 2026
AI Research Intern, graduate industry–academia program (M.S. thesis) — Seoul

- **Bio-Adaptive MeshGraphNet** GNN surrogate for Abaqus foot–ground contact; 186 meshes from 100 subjects
- **Physics losses** Laplacian, ARAP, Neo-Hookean, topological; weighted per subject by a learned network
- **Stability** multi-step rollout training; adaptive node masking at contact boundaries
- **Result** RMSE **1.258 mm**, 9.4% below Graphormer; physics terms account for a **41.2%** reduction
- **Talks** ISB 2025 and FBS 2025 orals (earlier version, 19.4% lower MAE than standard MeshGraphNet)

KIST Bionics Research Center (BC3Lab) — Dec 2022 – Jul 2023
Research Intern — Seoul

- **3D vessel pipeline** sole owner after mentor left; handed-over Res-UNet to 3D reconstruction from ultrasound

Publications

[P1] **BLANC: Adaptive Temporal Scheduling for Sign Language Production** — arXiv, under review
Youngmin Kim, ***Seoyeong Hwang***, Sujung Hong, Seong Jae Hwang

[J1] **Towards Robust Gait Identification: A Frequency Domain Approach in Varied Surveillance Environments** — IEEE Access, 2026
Yeojin Song*, Luca Quagliato*, Sewon Jang, Egene Chung, Seoyeon Ko, ***Seoyeong Hwang***, Junhyug Noh†, Taeyong Lee†
AUC 0.904, accuracy 0.949; proposed triplet-loss encoding, designed the pipeline, wrote experiments section

[C3] **LYRICS: Line-by-Line Lyric Generation with Joint Control of Syllables, Context, and Rhyme** — ICTC 2025
Seoyeon Ko*, Hyunseo Kim*, ***Seoyeong Hwang****, Jihyun Yu, Jeonghyun Kim, Hyunsoo Cho†, Junhyug Noh†

[C2] **Enhancing Foot Deformation Prediction Using Graph Neural Networks** — FBS 2025 (Oral)
Seoyeong Hwang, Haeun Yum, Hyesu Son, Taeyong Lee, Junhyug Noh

[C1] **Leveraging Graph Neural Networks for Accurate Foot Deformation Prediction** — ISB 2025 (Oral)
Seoyeong Hwang, Haeun Yum, Hyesu Son, Taeyong Lee, Junhyug Noh

*Equal contribution †Corresponding author FBS: Footwear Biomechanics Symposium

Patents & Software Copyrights

Patent application KR 10-2025-0150087 (co-inventor): *Predicting foot deformation* — Filed Oct 2025
Patent application KR 10-2025-0084626 (co-inventor): *Generating lyrics considering rhyme* — Filed Jun 2025
Software copyright application: rhyme-score metric system for lyric evaluation — Filed Jan 2025
Software copyright, MeowNet: individual cat identification — Registered Jun 2024

Research Projects

Digital Sleeponomics (NRF Korea) — Jun 2025 – Feb 2026
- Multimodal Transformer fusing EEG, ECG and music features for personalized insomnia intervention

Diagnostic and Assistive Footwear for People with Disabilities (KMDF national R&D) — Mar 2024 – Dec 2025
- 3D deformation-prediction framework for personalized insoles

Individual Cat Identification for Smart Pet Feeders (BMSMILE Co., Ltd., industry R&D) — Nov 2024 – Oct 2025
- Triplet-loss metric learning (ViT, MobileNet, ResNet) in a team of three; owned validation and the demo

Teaching & Honors

Content TA @ Boostcamp AI Tech 7: Model Optimization & Light-weighting — Aug 2024 – Jan 2025
Teaching Assistant @ Ewha: Computer Vision; AI Applied Mathematics — Mar 2024 – Dec 2024
Scholarships: AI Convergence Grad. School (all M.S. semesters); W4 admission (2018–19) — 2018 – 2025

Skills

Graph ML	MeshGraphNet, Graphormer, DCRNN, STGCN, Graph-WaveNet, MTGNN, D2STGNN
Methods	physics-informed regularization, metric learning, IRT (1PL–4PL, MIRT, DeepIRT), contextual bandits
LLM	LangChain, LangSmith, SFT/PEFT
Engineering	Python, PyTorch, FastAPI, Docker, Swift/SwiftUI, Manim, Git
Languages	Korean (native), English (OPIc AL)