Ayhan Suleymanzade

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Education

Korea Advanced Institute of Science and Technology (KAIST) *South Korea*
B.S. in Computer Science and Electrical Engineering - cGPA: 4.17/4.30, Rank: 2/143 *Sep 2021 - Dec 2025*
Technical University of Munich (TUM) *Germany*
Exchange Program in Informatics - cGPA: 1.0/5.0 (100/100) *Apr 2025 - Aug 2025*

Publications

(C: conference, W: workshop, *: equal contribution, †: equal advising)

[W1] **MUX: Continuous Reasoning via Multiplexed Tokens**
Ayhan Suleymanzade, Halil Alperen Gozeten, İsmail İlkan Ceylan†, Jinwoo Kim†
ICLR 2026 LLM Reasoning Workshop

[C3] **Diffusion Models Through a Global Lens: Are They Culturally Inclusive?** Zahra Bayramli*, **Ayhan Suleymanzade***, Na Min An, Huzama Ahmad, Eunsu Kim, Junyeong Park, James Thorne, Alice Oh
ACL 2025 (Oral Presentation)

[C2] **Revisiting Random Walks for Learning on Graphs**
Jinwoo Kim, Olga Zaghen*, **Ayhan Suleymanzade***, Youngmin Ryou, Seunghoon Hong
ICLR 2025 (Spotlight Presentation)

[C1] **Learning Probabilistic Symmetrization for Architecture Agnostic Equivariance**
Jinwoo Kim, Tien Dat Nguyen, **Ayhan Suleymanzade**, Hyeokjun An, Seunghoon Hong
NeurIPS 2023 (Spotlight Presentation)

Research Experience

AITHYRA *Austria*
Visiting Research Intern (Mentors: Prof. Ismail Ceylan, Prof. Micheal Bronstein) *Jan 2026 - Aug 2026*

- Working on continuous reasoning and flow language models [W1].

TUM Foundation of Deep Neural Networks Lab *Germany*
Visiting Research Intern (Mentor: Prof. Stefanie Jegelka) *Apr 2025 - Aug 2025*

- Designed depth and diversity controlled reasoning benchmarks showing that continuous and implicit CoT models collapse by up to 80–95% accuracy as reasoning depth or chain multiplicity increases.
- Identified credit-assignment and mode-collapse failures in latent alignment and proposed intermediate supervision to sustain multimodal reasoning dynamics.

KAIST System Intelligence Lab *South Korea*
Undergraduate Research Intern (Mentors: Minsu Kim, Prof. Jinkyoo Park) *Jul 2024 - Dec 2024*

- Developed the Learnable Local Search GFlowNet (LLS-GFN), introducing a joint training objective combining Maximum Likelihood Estimation and full Trajectory Balance to improve local search and mode-seeking capabilities.
- Achieved 2.3% stronger reward accumulation across tasks such as DNA, molecule, fragment, and RNA optimization.

KAIST Vision and Learning Lab *South Korea*
Undergraduate Research Intern (Mentors: Jinwoo Kim, Prof. Seunghoon Hong) *Feb 2023 - Jul 2024*

- Proposed an automorphism-invariant graph learning pipeline using random walk embeddings and analyzed its expressive power theoretically and empirically [C2].
- Developed a probabilistic symmetrization method for real-world graphs and adapted Vision Transformer insights for graph tasks, yielding competitive benchmarks (0.1355 → 0.3287 Hits@1) in PCQM-Contact [C1].

Work Experience

Mercari Inc. *Japan*
Machine Learning Engineer Intern *Jan 2025 – Mar 2025*

- Built a scalable text embedding pipeline with Apache Beam and GCS, improving storage efficiency by 5.3x, speed by 11.4x, and search reranking NDCG by 2.46%.
- Contributed to migrating the training pipeline from TensorFlow to PyTorch Lightning, deployed new features via Kubernetes, improved experimentation with Hydra, and optimized Docker builds by 6.7x.

StoneLab Inc. *South Korea*
AI Researcher and Developer *Jan 2024 - July 2024*

- Developed text-constrained music generation models for content creation on music platforms and engineered a high-

performance streamer for MusicGen, achieving a 9x increase in inference speed.
- Migrated codebases to Keras 3 and enabled multi-framework deployment using FastAPI and Flask.

EverEx Inc. *South Korea*
Computer Vision Research Intern (Mentor: Byung-Hoon Kim) *Dec 2022 - Feb 2023*

- Replicated and extended prior works on 3D human pose estimation, proposing a hybrid model combining Diffusion and Graph Convolutional Networks.
- Achieved state-of-the-art MPJPE of 8.93 mm (Walking) and 12.22 mm (Jogging) on HumanEva-I dataset, improving baseline by 1.4 mm and 0.9 mm.

Awards

- KAIST Q-day Award [Advanced Reasearch] (2025)
- KAIST Dean's List (Fall 2024)*
- KAIST Dean's List (Spring 2024)*
- KAIST Alumni Fellowship (2024)
- KAIST Presidential Fellowship (2024)
- KAIST College of Engineering Leadership Award (2024)
- KAIST Dean's List (Fall 2023)*
- KAIST Global Leadership Award [Challenge] (2023)
- KAIST Dean's List (Fall 2022)*
- International Physics Olympiad (IPhO) – 1 Bronze & 1 HM (2020–2021)
- National Physics Olympiad – 2 Gold (2020–2021)
- International Olympiad on Astronomy and Astrophysics (IOAA) – 1 HM (2020)
- International Junior Science Olympiad (IJSO) – Silver (2019)

*: Top 3% of College of Engineering in four semesters.

Professional Service

Ministry of Education of Azerbaijan *Azerbaijan*
National Coach, Coordinator, Leader *Sep 2021 - Present*

- Conducting intensive training camps, preparing handouts, proposing problems, and teaching various topics.
- Serving as a Leader at International venues (IPhO, EuPhO) and as jury member in Azerbaijan National Physics Olympiad, preparing and grading exams for national exams and team selection tests.

Teaching Assistant (TA), KAIST

- Foundations of Big Data Analytics (EE412) *Fall 2024*
- Introduction to Deep Learning (CS492I) *Fall 2023*

Projects

GFN-Check: Diverse Valid Test Inputs with Generative Flow Networks *Fall 2024*
AI Based Software Engineering

- Designed GFlowNet-based framework for diverse, valid input generation, addressing RL overfitting and storage issues.
- Outperformed RLCheck in diversity metrics on BST and Maven POM XML tasks.

Bridging Soft RL and GFlowNets *Spring 2024*
Deep Reinforcement Learning and Game AI

- Uncovered theoretical link between Soft RL and GFlowNets, enabling principled integration of advanced RL techniques within GFlowNets framework.
- Developed dynamic regularization and integrated PCL/Multi-step PCL methods, improving convergence stability, achieving 60× efficiency gains, and increasing mode coverage by 4%.

Exploring Mental Well-Being in Gaming *Spring 2024*
Computational Social Science

- Developed tree-based models (RF, GBM, EBM) on data from 13k+ gamers, achieving 80% accuracy in detecting mental well-being and delivering 30–35% performance gains over regression-based baselines.
- Validated findings through a KAIST survey and analyzed feature importance, identifying gaming hours and motivation to play as key mental health factors.

Scaling Transformers to Large Graphs *Spring 2023*
Graph ML and Mining

- Applied pure Transformer for node classification via distillation from a pretrained GNN.
- Outperformed GCN/GAT on Cora-ML, DBLP, PubMed, Wiki-CS by 1-3% node classification accuracy while alleviating oversmoothing and oversquashing.

Semi-Supervised Semantic Segmentation with CCT *Fall 2022*
Introduction to AI

- Developed CCT-based segmentation model with shared encoder and 40 auxiliary decoders.
- Integrated Temporal Ensembling and GAN regularization, improving PASCAL VOC mIoU from 73.2 to 73.5.

References

Prof. Stefanie Jegelka, Humboldt Professor at TUM stefanie.jegelka@tum.de
Prof. Seunghoon Hong, Associate Professor at KAIST seunghoon.hong@kaist.ac.kr
Prof. Alice Oh, Professor at KAIST alice.oh@kaist.edu