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*** *Sep 2021 - Feb 2026 (expected)*
Technical University of Munich (TUM) Germany
Exchange Program in Informatics *Apr 2025 - Aug 2025 (expected)*

Publications

[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)

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 and improved experimentation with Hydra and optimized Docker builds.

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 stronger reward accumulation across tasks such as DNA, molecule, fragment, and RNA optimization.

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.

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, achieving SOTA results with strong theoretical guarantees [C2].
- Developed a probabilistic symmetrization method for real-world graphs and adapted Vision Transformer insights for graph tasks, yielding competitive benchmarks [C1].

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

- Replicated and extended prior work by Gong et al. and Choi et al., 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, improving baseline by 1.4 mm and 0.9 mm.

Projects

GFN-Check: Diverse Valid Test Inputs with Generative Flow Networks *Fall 2024*

Project of AI Based Software Engineering course

- Designed and implemented a GFlowNet-based input generation framework to improve diversity and validity in software testing, effectively addressing overfitting and storage limitations common in rl-based approaches.
- Outperformed RLCheck in diversity metrics on BST and Maven POM XML tasks; explored local search and penalization for better structural coverage.

Bridging the Gap Between Soft Reinforcement Learning and Generative Flow Networks *Spring 2024*

Project of Deep Reinforcement Learning and Game AI course

- Redefined the GFlowNet objective to uncover a theoretical connection with Soft Reinforcement Learning, enabling the principled application of advanced RL techniques within the GFlowNet framework.
- Proposed two methods for learning the regularization parameter dynamically, improving convergence stability and training efficiency; integrated Soft RL methods such as PCL and Multi-step PCL to surpass baseline performance.

Exploring Mental Well-Being in Gaming *Spring 2024*

Project of Computational Social Science course

- Applied tree-based models (Decision Trees, Random Forests, Gradient Boosting, EBM) on data from 13,000+ participants, achieving up to 80.19% accuracy and outperforming baseline regressors by 30–35%. Validated results via a KAIST survey and visualized feature importance to identify key factors affecting mental well-being in gamers.

Scaling Transformers to Large-scale Graphs *Spring 2023*

Project of Graph Machine Learning and Mining course

- Applied a pure Transformer for node classification, trained via knowledge distillation from a pretrained GNN.
- Surpassed traditional MPNNs (GCN, GAT) on multiple datasets (Cora-ML, DBLP, PubMed, Wiki-CS) by achieving marginal accuracy improvements while addressing oversmoothing and oversquashing issues.

Semi-Supervised Semantic Segmentation with Cross-Consistency Training *Fall 2022*

Project of Introduction to Artificial Intelligence course

- Developed a semi-supervised semantic segmentation model on PASCAL VOC using a shared encoder and 41 decoders (1 main + 40 auxiliary); integrated Temporal Ensembling, GAN-based regularization (Seg-GAN), and encoder modifications, improving mIoU from 73.2 to 73.5.

Bottom-Up and Top-Down Attention for Image Captioning *Fall 2022*

Project of Introduction to Deep Learning course

- Replicated and enhanced a bottom-up top-down image captioning model using Fast-RCNN and LSTM, integrating an Auto-Reconstructor, Adaptive Attention with Visual Sentinel, and a novel salience-based attention mechanism to achieve results comparable to or exceeding the original implementation.

Awards

KAIST Dean's List (Top 3% of College of Engineering) – Fall 2022, Fall 2023, Spring 2024, Fall 2024	*2022-2024*
KAIST Alumni Fellowship (Granted to 7 undergraduate students)	*2024*
KAIST Presidential Fellowship	*2024*
KAIST College of Engineering Leadership Award	*2024*
KAIST Global Leadership Award [Challenge]	*2023*
International Physics Olympiad – 1 Bronze Medal and 1 Honorable Mention	*2020-2021*
National Physics Olympiad – 2 Gold Medals and "First of First" Nomination	*2020-2021*
International Olympiad on Astronomy and Astrophysics – Honorable Mention	*2020*
International Junior Science Olympiad – Silver Medal	*2019*

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 Experience

Teaching Assistant (TA), KAIST

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

References

Prof. Seunghoon Hong, Associate Professor at KAIST seunghoon.hong@kaist.ac.kr
Prof. Alice Oh, Professor at KAIST alice.oh@kaist.edu
Prof. Jaemin Yoo, Assistant Professor at KAIST jaemin@kaist.ac.kr