

# HUMAIRA KOUSAR

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**Framework:** Pytorch, OpenCV, Tensorflow

**Tools:** Git, Linux, Large-scale data processing

**Specialties:** Computer Vision, Federated/Split Learning, Active Learning, LLMs

**Languages:** Python, C, Java, x86 assembly, SQL

## Education

### Korea Advanced Institute of Science and Technology, KAIST

Daejeon, South Korea

**Ph.D.** in Electrical Engineering, CGPA: 3.46/4.30 (**KAIST Scholarship**)

Mar 2022 – June 2026 (Exp.)

Advisor: Prof. Jaekyun Moon

Research Area: Active Learning and Distributed Machine Learning

Thesis: Efficient Data Acquisition Techniques in Deep Learning (**Han Chul Hee Augustino Scholarship**)

### Korea Advanced Institute of Science and Technology, KAIST

Daejeon, South Korea

**M.S.** in Electrical Engineering, CGPA: 3.26/4.30 (**KAIST Scholarship**)

Aug 2020 - Feb 2022

Advisor: Prof. Jaekyun Moon

Thesis: Expediting Split Learning via Intermediate Feature Budgeting Strategy

### National University of Sciences and Technology, NUST

Islamabad, Pakistan

**B.S.** in Electrical Engineering, CGPA: 3.84/4.00 (**High Achiever Award**)

Sep 2015 - July 2019

Advisor: Prof. Naveed Iqbal

Thesis: WHEGSTR: A Multiterrain Robot with C-Shaped Whlegs, Implementation of Error

Minimization Technique and using Artificial Neural Network (ANN) (**Best Project Award@COMPPEC'19**)

## Professional Experience

### Moon Lab, School of EE, KAIST Research Assistant (Advisor: Prof. Jaekyun Moon)

Daejeon, South Korea

Sep 2020 - Present

- **Efficient Active Learning:** Accomplish 96% reduction in selection-phase computation of Active Learning by proposing PruneFuse, which combines structured pruning and weight-aligned model fusion to warm-start target training after data selection.
- **Federated and Split Learning:** Accomplished optimized global training efficiency in distributed setups under heterogeneous clients as measured by activation transmission overhead by doing the design of a Surrogate MoE for on-device data evaluation.
- **Routing Aware Active Learning:** Developed cross-architecture generalization with minimal adaptation cost as measured by a single-pass scoring metric by doing the fusion of four collective information signals into the CISAL framework.
- **Model Merging in Sparse Networks:** Devised storage-efficient serving of Foundation Model experts as measured by spectral-sparse decomposition by doing the development of Ada-HiSS for resource-constrained environments.

### School of Electrical Engineering, KAIST Teaching Assistant

Daejeon, South Korea

Feb 2025 - June 2025

- Machine Learning Basics and Practices

### School of Electrical Engineering, NUST Teaching Assistant

Daejeon, South Korea

Sep 2018 – Jan 2019

Feb 2019 - June 2019

- Introduction to Programming
- Digital Logic Design

## Patent & Funded Projects

### [Patent] Device and Method for Distribution Aware Active Learning using Gaussian Mixture. (**Collaboration**)

Younghyun Park, Jungwuk Park, Dong-jun Han, Wonjeong Choi, Kousar Humaira and Jaekyun Moon

Application Number: KR 10-2024-0035374, Application Date: Mar 13, 2024

### [Project] Active Learning Algorithms for Efficient Utilization of Unlabeled Defense Data (**Project Leader**)

### [Project] Efficient Data Selection via Weight Pruning and Network Fusion (**Project Leader**)

### [Project] Expediting Split Learning via Intermediate Feature Budgeting Strategy (**Project Leader**)

### [Project] Routing Aware Computation Efficient Active Learning via Collective Information Signals. (**Project Leader**)

Center for Applied Research in Artificial Intelligence (CARAI), Funded by Agency for Defense Development (ADD); (2021 – 2026)

### [Project] Communication and Computation Efficient Personalization of Foundation Models in Federated Learning Environment (**Collaboration**)

NAVER-Intel-KAIST AI Joint Research Center (NIK AI Research Center), Funded by NAVER-Intel Co-Lab.; (2024)

## Publications and Preprints

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- **H Kousar**, HI Bhatti, J Moon. "PruneFuse: Efficient Data Selection via Weight Pruning and Network Fusion". *Featured Certification (Spotlight)* in Transactions on Machine Learning Research, Mar. 2026
- **H Kousar**, HI Bhatti, MM Rahimi, J Moon. "CEAL: Computation Efficient Active Learning via Collective Information Signals." in preparation for Neural Information Processing Systems (NeurIPS) 2026.
- **H Kousar**, J Moon. "AL on Edge: Leveraging Surrogate Routing for Distributed Active Learning." in preparation for Neural Information Processing Systems (NeurIPS) 2026.
- HI Bhatti, **H Kousar**, J Moon. "Merging in the Small Room: A Spectral-Space Decomposition for Pruned Experts" in preparation for Neural Information Processing Systems (NeurIPS) 2026
- MM. Rahimi, M. Heidari, **H Kousar**, Daewon Seo, J Moon. "Low-Rank Aggregation via Optimal Right-Space Projection." (preprint) under review at International Conference on Machine Learning (ICML), 2026.
- MM. Rahimi, Y Park, **H. Kousar**, Hasnain I. Bhatti, Dong-Jun Han, J. Moon, "Reshape-then-Factorize: Communication-Efficient FL via Model-Agnostic Projection Optimization". (preprint) under review at International Conference on Machine Learning (ICML), 2026
- Y Park, DJ Han, J Park, W Choi, **H Kousar**, J Moon. "Distribution Aware Active Learning via Gaussian Mixtures", in preparation for Neural Information Processing Systems (NeurIPS) 2026.
- **H Kousar**, HI Bhatti. "Pruning-based Data Selection and Network Fusion for Efficient Deep Learning". Attributing Model Behavior at Scale (ATTRIB) workshop at Neural Information Processing Systems (NeurIPS), Dec. 2024.
- MM Rahimi, HI Bhatti, Y Park, **H Kousar**, J Moon. "EvoFed: Leveraging Evolutionary Strategies for Communication-Efficient Federated Learning." Neural Information Processing Systems (NeurIPS), Dec. 2023.
- Y Park, DJ Han, J Park, W Choi, **H Kousar**, J Moon. "Distribution Aware Active Learning via Gaussian Mixtures." Pitfalls of limited data and computation for Trustworthy Workshop at International Conference of Learning Representations 2023.
- **H Kousar**, M Atif, H Ali, MH Kundi. "WHEGSTR: A Multiterrain Robot with C-Shaped Whegs, Implementation of Error Minimization Technique and using Artificial Neural Network (ANN)." International Conference on Green and Human Information Technology (ICGHIT). IEEE, 2019.

## Academic Service

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- **Workshop Organizer.** [Speaker & Panel Chair] AIM4DK: AI Modeling for Disappearing Knowledge. *Workshop at IJCAI-ECAI'26*.
- **Conference Reviewer**, ATTRIB@NeurIPS'24, WiML@NeurIPS'25, AAAI'26, ICLR'26, NeurIPS'26
- **Volunteer:** Supported WiML@NeurIPS'25 and the KAIST 1:1 English Program.
- **Event Manager & Host:** Managed WIE-IEEE (NUST) and the EE Winter Camp at KAIST
- **IEEE Speaker:** Delivered technical workshops as a guest speaker.

## Honors and Leadership

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### Academic Awards & Recognition

- **Travel Award, WiML Workshop @ NeurIPS 2025:** Competitive \$1,400 grant for conference attendance
- **2nd Position, COMPPEC'19:** Awarded at a National Level Project Competition for senior year research
- **Best Campus Ambassador Award:** Recognized as the top ambassador during PSYWSC'18.
- **Regional Distinction in Essay Writing:** Awarded by the Chamber of Commerce, Pakistan
- **High Achiever Award:** Recognized during B.S. at NUST university.
- **Project Award:** during summer internship at Rohde & Schwarz, Pakistan (Pvt) Ltd.

### Leadership & Mentorship

- **KAIST Graduate Ambassador:** Representing the university and assisting international recruitment (2023–26).
- **Vice President, Pakistan Student Association (PSA):** Led student executive board at KAIST.
- **Student Mentor (ISSS, KAIST & Daedeok High School):** Guided international students and local high school students.
- **Campus Ambassador:** Represented NUST university at COMPPEC'19.
- **Course Representative:** Acted as a student liaison at the college level.
- **Social Work Head:** at Pakistan Red Crescent Society.

## Languages

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- English (*Bilingual Proficiency*)
- Urdu (*Native Proficiency*)
- Punjabi (*Native Proficiency*)
- Korean (*KIIP Level 2*)