

MAJID AHMAD KUNDROO

Postdoctoral Researcher

Federated Learning | Distributed Computing | Edge Computing | Edge AI | Deep Learning

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EDUCATION

PhD in Information & Communication Engineering
March 2022 – August 2025
Cheongju, South Korea
Chungbuk National University
Thesis: Enhancing Federated Learning: Strategies for Adaptive Hyperparameter Tuning and Robust Aggregation.
Advisor: Prof. Taehong Kim

M.S. in Computer Applications
Sept 2016 – Sept 2019
J&K, India
IUST
Thesis: Intelligent Hybrid Recommender System On Movie Reviews
Advisor: Prof. Muzaffar Rasool Bhat

EXPERIENCE

Postdoctoral Researcher
August 2025 – Present
Cheongju, South Korea
Chungbuk National University
Conduct advanced research on federated learning focusing on scalability, privacy, and real-world deployments.
Mentor graduate students, collaborate with faculty, international partners, and industry on applied research projects.

Visiting Researcher
July 2025 – August 2025
Brisbane, Australia
University of Southern Queensland (UniSQ)
Collaborated with Prof. Di Wu on privacy-preserving human activity recognition using wearable devices.
Conducted joint research on federated learning for wearable and sensor-based systems.

Research Assistant (Ph.D. Researcher)
March 2022 – August 2025
Cheongju, South Korea
Chungbuk National University
Conducted full-time doctoral research in federated learning and edge computing, leading to high-impact journal and conference publications, patents, and open-source software contributions.
Designed and evaluated scalable, privacy-preserving federated learning algorithms for real-world edge environments.
Contributed to multiple funded research projects in collaboration with international academic and industrial partners.
Mentored junior lab members and graduate students on research methodology, experimentation, and academic writing.

Research Assistant
August 2020 – February 2022
J&K, India
IUST, J&K
Contributed to a funded research project on apple disease detection and recommendation systems (ADDR), developing CNN models for plant disease classification.
Built an Android application for automated disease detection from leaf images and treatment recommendation.

Software Developer
May 2019 – April 2020
J&K, India
Cloud Innovation Partners
Developed cloud-based platforms for backup and restoration of SaaS data.
Implemented cloud-based synthetic test data generation tools.

TEACHING EXPERIENCE

Graduate Teaching Assistant	Chungbuk National University
[8836459] Advanced Future Internet (Lecturer: Prof. Taehong Kim)	Spring 2023
[8836566] Advanced Computer Networks (Lecturer: Prof. Taehong Kim)	Spring 2024
[8836508] IoT Theory and Practice (Lecturer: Prof. Taehong Kim)	Spring 2025

- Key Responsibilities:**
- Co-delivered introductory lecture modules on IoT, edge computing, and federated learning for graduate students.
 - Guided and evaluated weekly graduate student research-paper presentations and led technical discussion sessions.
 - Mentored IoT, edge computing, and federated learning projects and assessed final presentations.
 - Assisted with midterm/final exam preparation and grading, and general course logistics.

FUNDED PROJECTS

Video Anomaly Recognition (VAR) Based on Federated Learning Role: Research Assistant
Funding: Electronics and Telecommunications Research Institute (ETRI)  April 2025 – November 2025
Designed and evaluated a federated learning framework for video anomaly recognition that mitigates semantic misalignment across heterogeneous clients using prototype-based alignment, enabling robust fine-grained anomaly representation under non-IID data distributions.
Outcomes: Peer-reviewed journal publication [J01] and open-source implementation.

Reinforcement Learning–Based Laser Cutting Machine Parameter Optimization Role: Research Assistant
Funding: NPS Co., Ltd. (Cheongju, South Korea)  January 2024 – December 2024
Developed a reinforcement learning–based framework for optimizing laser cutting machine parameters, enabling adaptive control and quality-aware optimization through tight integration with industrial laser processing equipment.
Outcomes: Peer-reviewed journal publication [J07] and patent (Korea) [P03].

Development and Evaluation of SILS in SUMO simulation environment Role: Research Assistant
Funding: Motov Inc. (Seoul, South Korea)  June 2022 – April 2023
Designed and evaluated a cooperative multi-agent federated reinforcement learning framework for intelligent traffic signal control, enabling collaboration among agents to minimize travel time in dynamic traffic environments using the SUMO simulator.
Outcomes: Peer-reviewed SCIE journal publication [J08] and open-source implementation.

Apple Disease Detection and Recommendation System (ADDR) Role: Research Assistant
Funding: EDC-IUST  August 2020 – February 2022
Developed deep learning models for apple disease detection from leaf and fruit images and implemented an Android application for automated disease diagnosis and treatment recommendation.
Outcomes: Peer-reviewed SCIE journal publication [J11], patent (India) [P07], and a deployed Android app.

SELECTED PUBLICATIONS

 **Journal Articles**

[J01] G. Haider, M. Kundroo, B. Eom, D.-H. Park, C. Chen, and T. Kim, “Fedvar: Prototype-aligned federated framework for video anomaly recognition,” *Future Generation Computer Systems*, p. 108 745, 2026, ISSN: 0167-739X. DOI: 10.1016/j.future.2026.108745 [IF 5.9, JCR Top 12.7%].

[J02] M. Kundroo, S. H. Kim, and T. Kim, “Fedchyper: Client-side dynamic hyper-parameter tuning for enhanced federated learning,” *Journal of Systems Architecture*, vol. 177, p. 103 843, Aug. 2026, ISSN: 1383-7621. DOI: 10.1016/j.sysarc.2026.103843 [IF 4.1, JCR Top 17.4%].

- [J03] G. Haider, **M. Kundroo**, L. Zhang, J. Choi, and T. Kim, "Fedcsga: Evolutionary client selection with joint statistical and system heterogeneity in federated learning," *Journal of Systems Architecture*, p. 103 813, May 2026, ISSN: 1383-7621. DOI: 10.1016/j.sysarc.2026.103813 [IF 4.1, JCR Top 17.4% (Co-Corresponding Author)].
- [J04] **M. Kundroo**, T. Singh, and T. Kim, "Fedlbw: A loss-based weighting strategy for federated learning on non-iid data in wireless networks," *Expert Systems with Applications*, p. 130 487, Apr. 2026, ISSN: 0957-4174. DOI: 10.1016/j.eswa.2025.130487 [IF 7.5, JCR Top 6.1%].
- [J05] R. Selo, **M. Kundroo**, and T. Kim, "Fedtvd: Balancing data quality and quantity for robust federated learning," *Future Generation Computer Systems*, vol. 176, p. 108 177, Mar. 2026, ISSN: 0167-739X. DOI: 10.1016/j.future.2025.108177 [IF 6.1, JCR Top 9.9%].
- [J06] **M. Kundroo**, G. Haider, N. Khoa, A. W. Mamond, and T. Kim, "Fedeasy: Federated learning with ease," *SoftwareX*, vol. 31, p. 102 276, Jul. 2025, ISSN: 2352-7110. DOI: 10.1016/j.softx.2025.102276 [IF 2.4, JCR Top 48%].
- [J07] K. Q. Pham, **M. Kundroo**, G. Ban, S. Bae, and T. Kim, "Reinforcement learning-based laser cutting machine parameter optimization," *Journal of Intelligent Manufacturing*, May 2025, ISSN: 1572-8145. DOI: 10.1007/s10845-025-02619-z [IF 7.4, JCR Top 13.4%].
- [J08] A. W. Mamond, **M. Kundroo**, S.-e. Yoo, S. Kim, and T. Kim, "Fldqn: Cooperative multi-agent federated reinforcement learning for solving travel time minimization problems in dynamic environments using sumo simulation," *Sensors*, no. 3, Feb. 2025, ISSN: 1424-8220. DOI: 10.3390/s25030911 [IF 3.5, JCR Top 34.8%].
- [J09] **M. Kundroo** and T. Kim, "Demystifying impact of key hyper-parameters in federated learning: A case study on cifar-10 and fashionmnist," *IEEE Access*, pp. 1–1, Aug. 2024. DOI: 10.1109/ACCESS.2024.3450894 [IF 3.4, JCR Top 34.5%].
- [J10] **M. Kundroo** and T. Kim, "Federated learning with hyper-parameter optimization," *Journal of King Saud University - Computer and Information Sciences*, vol. 35, no. 9, p. 101 740, Aug. 2023, ISSN: 1319-1578. DOI: 10.1016/j.jksuci.2023.101740 [IF 5.2, JCR Top 15.9%].
- [J11] A. Assad et al., "Apple diseases: Detection and classification using transfer learning," *Quality Assurance and Safety of Crops & Foods*, vol. 15, no. SP1, pp. 27–37, Jul. 2023, [IF 4.6, JCR Top 17.5%].

International Conferences

- [C01] **M. Kundroo** and T. Kim, "Efficient federated learning with adaptive client-side hyper-parameter optimization," in *2023 IEEE 43rd International Conference on Distributed Computing Systems (ICDCS)*, Aug. 2023, pp. 973–974. DOI: 10.1109/ICDCS57875.2023.00103 [CORE A].
- [C02] **M. Kundroo**, M. Qadri, and M. R. Bhat, "Social media as enablers for social change: Viewing public health, participation of citizenry, user reception through twitter perception about covid-19 vaccination using ai," in *International Conference on Social Media & Developing Societies (IMPETUS 2021)*, 2021.

Domestic Conferences

- [D01] G. Haider, **M. Kundroo**, and T. Kim, "GA-FedCS: Dynamic Client Selection in Federated Learning using Genetic Algorithm," in *Proceedings of the 2024 Summer Conference of the Korean Artificial Intelligence Society, KAIS*, Aug. 2024.
- [D02] **M. Kundroo** and T. Kim, "Effects of Model Hyper-parameters in Federated Learning: A Short Analysis," in *Proceedings of the 2023 Korean Digital Contents Society Conference, KDCS*, Jul. 2023, pp. 57–58, [Best Paper Award].

Under Review

- [U01] A. W. Mamond, **M. Kundroo**, and T. Kim, "PFLedl: Towards reliable and accurate personalized federated learning via dirichlet-based evidential deep learning," [Under Review].
- [U02] **M. Kundroo** and T. Kim, "Fisher aggregation with adaptive client weighting for one-shot federated learning," [Under Review].
- [U03] **M. Kundroo** and T. Kim, "Federated learning with server-side fine-tuning on condensed data," [Under Review].

Patents

- [P01] M. Kundroo and T. Kim, "Federated learning system and method based on aggregation and refining using condensed data," Patent Application (Korea) 10-2026-0046XXX, 2026.
- [P02] M. Kundroo, Y.-H. Choi, and T. Kim, "Method and system for hyperparameter optimization in federated learning," Patent Registered (Korea) 10-2906459, 2025.
- [P03] P. K. Quan, M. Kundroo, and T. Kim, "Laser processing quality management system and parameter optimization using reinforcement learning," Patent Application (Korea) 10-2025-0260XXX, 2025.
- [P04] M. Kundroo and T. Kim, "System and methods for using loss-based weighting in federated learning," Patent Application (Korea) 10-2024-0164XXX, 2024.
- [P05] M. Kundroo, Y.-H. Choi, and T. Kim, "Method and device for improving the performance of distributed federated learning," Patent Application (Korea) 10-2023-0106XXX, 2023.
- [P06] M. Kundroo and T. Kim, "Early disease detection system and method in wearable device based on federated learning," Patent Application (Korea) 10-2023-0020XXX, 2023.
- [P07] M. R. Bhat et al., "A system for detection of disease in plants and analysing treatment process thereof," Patent Application (India) 202211016238 A, 2022.

PROFESSIONAL SERVICES

Program Committee: AAAI-26. **Invited Reviewer:** IEEE Internet of Things Journal (IoT-J); IEEE Transactions on Network Science and Engineering (TNSE); Information Sciences (Elsevier); The Journal of Supercomputing; IEEE Access ...

AWARDS AND ACHIEVEMENTS



Excellence Award for Graduate Student Academic Festival (2024)

Received the Excellence Award from BK21 CBNU Information Technology Education Research Group.



Outstanding Graduate Researcher Award 2023

Received the Outstanding Graduate Researcher Award in 2023 from Chungbuk National University.



Best Paper Award

Received the Best Paper Award for "Effects of Model Hyper-parameters in Federated Learning: A Short Analysis" at the Korean Digital Contents Society Conference, in July 2023.

TECHNICAL SKILLS

Programming Languages

Python

PHP

JavaScript

ML/DL Frameworks

PyTorch

TensorFlow

scikit-learn

Data & Tools

Pandas

Matplotlib

MySQL

REFEREES

References will be provided upon request.

FULL PUBLICATIONS LIST

Journal Articles

- [01] G. Haider, **M. Kundroo**, B. Eom, D.-H. Park, C. Chen, and T. Kim, "Fedvar: Prototype-aligned federated framework for video anomaly recognition," *Future Generation Computer Systems*, p. 108 745, 2026, ISSN: 0167-739X. DOI: 10.1016/j.future.2026.108745 [IF 5.9, JCR Top 12.7%].
- [02] **M. Kundroo**, S. H. Kim, and T. Kim, "Fedchyper: Client-side dynamic hyper-parameter tuning for enhanced federated learning," *Journal of Systems Architecture*, vol. 177, p. 103 843, Aug. 2026, ISSN: 1383-7621. DOI: 10.1016/j.sysarc.2026.103843 [IF 4.1, JCR Top 17.4%].
- [03] G. Haider, **M. Kundroo**, L. Zhang, J. Choi, and T. Kim, "Fedcsqa: Evolutionary client selection with joint statistical and system heterogeneity in federated learning," *Journal of Systems Architecture*, p. 103 813, May 2026, ISSN: 1383-7621. DOI: 10.1016/j.sysarc.2026.103813 [IF 4.1, JCR Top 17.4% (Co-Corresponding Author)].
- [04] **M. Kundroo**, T. Singh, and T. Kim, "Fedlbw: A loss-based weighting strategy for federated learning on non-iid data in wireless networks," *Expert Systems with Applications*, p. 130 487, Apr. 2026, ISSN: 0957-4174. DOI: 10.1016/j.eswa.2025.130487 [IF 7.5, JCR Top 6.1%].
- [05] R. Selo, **M. Kundroo**, and T. Kim, "Fedtvd: Balancing data quality and quantity for robust federated learning," *Future Generation Computer Systems*, vol. 176, p. 108 177, Mar. 2026, ISSN: 0167-739X. DOI: 10.1016/j.future.2025.108177 [IF 6.1, JCR Top 9.9%].
- [06] T. Singh, **M. Kundroo**, D.-H. Park, and T. Kim, "Fedmeanstd: Federated aggregation with outliers filtering," *IEEE Access*, vol. 14, pp. 6194–6206, Mar. 2026. DOI: 10.1109/ACCESS.2025.3648805 [IF 3.6, JCR Top 35.2%].
- [07] A. W. Mamond, **M. Kundroo**, and T. Kim, "Autoencoder-based decentralized federated learning for efficient communication," *Computer Networks*, vol. 272, p. 111 676, Nov. 2025, ISSN: 1389-1286. DOI: 10.1016/j.comnet.2025.111676 [IF 4.6, JCR Top 17.5%].
- [08] R. Selo, **M. Kundroo**, and T. Kim, "Impact of network topologies on decentralized federated learning," *Cluster Computing*, vol. 28, no. 15, p. 996, Oct. 2025. DOI: 10.1007/s10586-025-05683-5 [IF 4.1, JCR Top 20.7%].
- [09] T. Singh, **M. Kundroo**, S. Kim, and T. Kim, "Enhancing traffic management in smart cities: A federated learning approach for traffic light violation detection," *Human-centric Computing and Information Sciences*, vol. 15, no. 52, pp. 2–22, Sep. 2025. DOI: 10.22967/HGIS.2025.15.052 [IF 3.9, JCR Top 26.3%].
- [10] **M. Kundroo**, G. Haider, N. Khoa, A. W. Mamond, and T. Kim, "Fedeasy: Federated learning with ease," *SoftwareX*, vol. 31, p. 102 276, Jul. 2025, ISSN: 2352-7110. DOI: 10.1016/j.softx.2025.102276 [IF 2.4, JCR Top 48%].
- [11] K. Q. Pham, **M. Kundroo**, G. Ban, S. Bae, and T. Kim, "Reinforcement learning-based laser cutting machine parameter optimization," *Journal of Intelligent Manufacturing*, May 2025, ISSN: 1572-8145. DOI: 10.1007/s10845-025-02619-z [IF 7.4, JCR Top 13.4%].
- [12] A. W. Mamond, **M. Kundroo**, S.-e. Yoo, S. Kim, and T. Kim, "Fldqn: Cooperative multi-agent federated reinforcement learning for solving travel time minimization problems in dynamic environments using sumo simulation," *Sensors*, no. 3, Feb. 2025, ISSN: 1424-8220. DOI: 10.3390/s25030911 [IF 3.5, JCR Top 34.8%].
- [13] **M. Kundroo** and T. Kim, "Demystifying impact of key hyper-parameters in federated learning: A case study on cifar-10 and fashionmnist," *IEEE Access*, pp. 1–1, Aug. 2024. DOI: 10.1109/ACCESS.2024.3450894 [IF 3.4, JCR Top 34.5%].
- [14] T. Singh, **M. Kundroo**, and T. Kim, "Wsn-driven advances in soil moisture estimation: A machine learning approach," *Electronics*, vol. 13, no. 8, Apr. 2024, ISSN: 2079-9292. DOI: 10.3390/electronics13081590 [IF 2.6, JCR Top 44.5%].
- [15] **M. Kundroo** and T. Kim, "Federated learning with hyper-parameter optimization," *Journal of King Saud University - Computer and Information Sciences*, vol. 35, no. 9, p. 101 740, Aug. 2023, ISSN: 1319-1578. DOI: 10.1016/j.jksuci.2023.101740 [IF 5.2, JCR Top 15.9%].
- [16] A. Assad et al., "Apple diseases: Detection and classification using transfer learning," *Quality Assurance and Safety of Crops & Foods*, vol. 15, no. SP1, pp. 27–37, Jul. 2023, [IF 4.6, JCR Top 17.5%].
- [17] P. K. Quan, **M. Kundroo**, and T. Kim, "Experimental evaluation and analysis of federated learning in edge computing environments," *IEEE Access*, pp. 33 628–33 639, Apr. 2023. DOI: 10.1109/access.2023.3262945 [IF 3.4, JCR Top 34.5%].
- [18] L. H. Phuc, **M. Kundroo**, D.-H. Park, S. Kim, and T. Kim, "Node-based horizontal pod autoscaler in KubeEdge-based edge computing infrastructure," *IEEE Access*, vol. 10, pp. 134 417–134 426, Dec. 2022. DOI: 10.1109/access.2022.3232131 [IF 3.4, JCR Top 34.5% (Equal Contribution)].

- [19] M. Bhat, M. Qadri, N.-A. Beg, **M. Kundroo**, N. Ahanger, and B. Agarwal, "Sentiment analysis of social media response on the covid19 outbreak," *Brain, Behavior, and Immunity*, vol. 87, pp. 136–137, 2020, ISSN: 0889-1591. DOI: 10.1016/j.bbi.2020.05.006 [IF 7.2, JCR Top 7.8%].
 - [20] M. R. Bhat, B. Bashir, **M. Kundroo**, and N. A. Ahanger, "Understanding twitter hashtags from latent themes using biterm topic model," *Recent Patents on Engineering*, vol. 14, no. 3, pp. 440–447, Nov. 2020, [Scopus].
 - [21] M. R. Bhat, **M. Kundroo**, T. A. Tarray, and B. Agarwal, "Deep LDA: A new way to topic model," *Journal of Information and Optimization Sciences*, vol. 41, no. 3, pp. 823–834, Jun. 2019. DOI: 10.1080/02522667.2019.1616911 [ESCI].
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International Conferences

- [01] **M. Kundroo** and T. Kim, "A concise study on the influence of model hyper-parameters in federated learning," in *2023 International Conference on Artificial Intelligence, Machine Learning & Intelligent Systems (ICAIMLIS2023)*, Oct. 2023.
 - [02] **M. Kundroo** and T. Kim, "Efficient federated learning with adaptive client-side hyper-parameter optimization," in *2023 IEEE 43rd International Conference on Distributed Computing Systems (ICDCS)*, Aug. 2023, pp. 973–974. DOI: 10.1109/ICDCS57875.2023.00103 [CORE A].
 - [03] **M. Kundroo**, M. Qadri, and M. R. Bhat, "Understanding twitter usage during covid19 and analyzing perceptions," in *International Conference on recent COVID-19 studies in Social Sciences*, 2021.
 - [04] **M. Kundroo**, M. Qadri, and M. R. Bhat, "Social media as enablers for social change: Viewing public health, participation of citizenry, user reception through twitter perception about covid-19 vaccination using ai," in *International Conference on Social Media & Developing Societies (IMPETUS 2021)*, 2021.
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- [01] G. Haider, **M. Kundroo**, and T. Kim, "GA-FedCS: Dynamic Client Selection in Federated Learning using Genetic Algorithm," in *Proceedings of the 2024 Summer Conference of the Korean Artificial Intelligence Society, KAIS*, Aug. 2024.
 - [02] **M. Kundroo** and T. Kim, "Effects of Model Hyper-parameters in Federated Learning: A Short Analysis," in *Proceedings of the 2023 Korean Digital Contents Society Conference, KDCS*, Jul. 2023, pp. 57–58, [Best Paper Award].
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Book Chapter

- [01] M. Qadri, M. Bhat, **M. Kundroo**, I. Chilwa, and G. Bouvier, "What are millions of hashtags '#' and tweets saying? Extracting themes from Twitter communication using biterm topic model," in *Twitter: Global Perspectives, Uses and Research Techniques Perspectives, Uses and Research Techniques*. Nova Science Publishers, Mar. 2019, pp. 293–316.
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Under Review

- [01] A. W. Mamond, **M. Kundroo**, and T. Kim, "PFLedl: Towards reliable and accurate personalized federated learning via dirichlet-based evidential deep learning," [Under Review].
 - [02] **M. Kundroo** and T. Kim, "Fisher aggregation with adaptive client weighting for one-shot federated learning," [Under Review].
 - [03] **M. Kundroo** and T. Kim, "Federated learning with server-side fine-tuning on condensed data," [Under Review].
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Patents

- [01] **M. Kundroo** and T. Kim, "Federated learning system and method based on aggregation and refining using condensed data," Patent Application (Korea) 10-2026-0046XXX, 2026.
- [02] **M. Kundroo**, Y.-H. Choi, and T. Kim, "Method and system for hyperparameter optimization in federated learning," **Patent Registered (Korea)** 10-2906459, 2025.
- [03] P. K. Quan, **M. Kundroo**, and T. Kim, "Laser processing quality management system and parameter optimization using reinforcement learning," Patent Application (Korea) 10-2025-0260XXX, 2025.
- [04] **M. Kundroo** and T. Kim, "System and methods for using loss-based weighting in federated learning," Patent Application (Korea) 10-2024-0164XXX, 2024.
- [05] **M. Kundroo**, Y.-H. Choi, and T. Kim, "Method and device for improving the performance of distributed federated learning," Patent Application (Korea) 10-2023-0106XXX, 2023.
- [06] **M. Kundroo** and T. Kim, "Early disease detection system and method in wearable device based on federated learning," Patent Application (Korea) 10-2023-0020XXX, 2023.
- [07] M. R. Bhat et al., "A system for detection of disease in plants and analysing treatment process thereof," Patent Application (India) 202211016238 A, 2022.