Atif Rizwan

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Summary

I have submitted my dissertation for my Ph.D. in Computer Engineering at Jeju National University, where I specialized in distributed machine learning and the Internet of Things (IoT). My research has been concentrated on Federated Learning (FL) and Decentralized Federated Learning (DFL), resulting in over 25 publications in renowned journals like Elsevier IoT and IEEE IoT. I have developed innovative FL and DFL frameworks, which are detailed in demonstrations available at FL1, FL2, DFL. My work primarily addresses model consolidation for non-IID data, Neural Architecture Search, and synchronization strategies in FL/DFL environments, catering specifically to resource-constrained devices.

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- Total articles published = **30**
- Citation Count (Google scholar) = **220**
- Cumulative Impact Factor = **123.5**
- H-index = **8**, i10-index = **6**

- Published SCI/E papers = **29**
- Book chapter = **01**
- Articles In-review = **03**
- Corresponding author = **3**

Research Interests

- Artificial Intelligence of Things
- Applied Machine Learning
- Deep Learning

- Federated Learning
- Digital Twins
- Data Science

Education

Mar 2020 - Jan 2024
PhD Computer Engineering, *Department of Computer Engineering, Jeju National University,Jeju-si, Republic of Korea*, **CGPA**: 4.39/4.5.
Thesis Title: Joint NAS and Topology Optimization for Decentralized Federated Learning in AIoT Digital Twin Networks

Feb-2018 - Jan-2020
Master of Science in Computer Science (MSCS), *Department of Computer Science, COMSATS University Islamabad,Attock, Punjab,Pakistan*, **CGPA**: 3.63/4.0.
Thesis Title: WR-SVM model based on the margin radius approach for solving the minimum enclosing ball problem in support vector machine classification

Feb-2016 - Jan-2018
Master of Computer Science (MCS), *Department of Computer Science, COMSATS University Islamabad,Attock, Punjab,Pakistan*, **CGPA**: 3.83/4.0.
Thesis Title: Database, OOP, Data Structure, Visual Programming, Scripting Language, Artificial Intelligence, Compiler Construction, Computer Architecture, COAL, Computer Communication and Networks

2013 - 2015
Bachelor of Science (BSC), *University of the Punjab,Lahore, Punjab,Pakistan*, **Marks**: 519/800.
Major Subjects: Calculus, Mathematical Method, Economics, Visual Basic, Operating System, Database

Awards

PhD Scholarship
Awarded PhD Scholarship 2020

1st Position holder
Master of Science in Computer Science (MSCS) 2020

Campus Gold Medal
Master of Computer Science (MCS) 2018

Institute Silver Medal
Master of Computer Science (MCS) 2018

Professional Experience

Spring 2018- **Visiting Lecturer**, *COMSATS University Islamabad, Attock Campus*, .
Spring 2020 **Responsibilities:** Leading programming labs in Java, Python, and C#. Inspiring and guiding students to engage in diverse industry projects.

Technical Skills

Programming	Python, Java, C++, C#, PhP
Frameworks & CMS	DJango, Flask, Codeignitor, MVC.
Web Development	FrontEnd- HTML, CSS, Bootstrap, Javascript, jquery,BackEnd- Python, PhP
Databases	SQL, MySQL (Mongo DB), SQLite
Software	Spyder, Jypyter, MATLAB, Sublime Text, Pycharm, Visual Studio, Anaconda, Dreamweaver, Eclipse, Net Beans
Protocols	IEEE 802.11, HTTP, CoAP, MQTT, TCP/IP
Operating Systems	Ubuntu, Raspbian, Windows

Research Projects

April, 2023 - **Neural Architecture Search for Resource Constraint Devices in DFL**, ***Sponsor:*** *Jeju National Uni-*
Present *versity, South Korea.*
Description: The heterogeneous nature of edge devices, varying in computational power and data distribution, poses a significant challenge. This disparity necessitates the optimization of learning models tailored to the constraints and capabilities of each device. Enter Neural Architecture Search (NAS), a technique to automate the design of neural network architectures. By integrating NAS into DFL, we can optimize models to suit the diverse landscape of edge computing, enhancing efficiency and performance.

April, 2023 - **Optimization of Topology in DFL**, ***Sponsor:*** *Jeju National University, South Korea.*
Present **Description:** The topology of the decentralized network plays a crucial role in the efficiency of DFL. Topology learning involves determining the optimal way in which nodes (edge devices) communicate with each other, a critical factor in minimizing latency and maximizing model divergence.

March, 2023 - **Digital twin for Decentralized Federated Learning**, ***Sponsor:*** *Jeju National University, South Korea.*
Present **Description:** Edge devices often lack an interface and are deployed remotely, a digital twin becomes indispensable for remotely monitoring and controlling the training process. This virtual representation allows for real-time insights and adjustments, ensuring optimal performance and addressing potential issues proactively.

Dec, 2022 - **Personalized Hierarchical Heterogeneous FL**, ***Sponsor:*** *Jeju National University, South Korea.*
April, 2023 **Description:** Training of personalized model in hierarchical and heterogeneous environment for smart home thermal comfort

Dec, 2021 - **Digital Twin for Centralized Federated Learning**, ***Sponsor:*** *Jeju National University, South Korea.*
May 2022 **Description:** Design a DT framework to monitor and control remotely deployed FL clients

March, 2022 - **Sampling-Based Model Consolidation for Attack Prevention in Federated Learning**, ***Sponsor:*** *Jeju*
May 2022 *National University, South Korea.*
Description: Selection of clients model based on their performance on local data and sampled data on server using normal distribution.

July, 2021 - **Indoor Environment Optimization Techniques using Deep Learning in Edge Computing Environ-**
April, 2022 **ments** *Sponsor:* Ministry of Education- National Research Foundation of Korea, Participation: Research assistant

Dec, 2021 - **Optimal location for Water Drilling**, ***Sponsor:*** *Electronics and Telecommunications Research Institute*
May 2022 *(ETRI), South Korea.*
Description: Find the soft layer area to minimize the risk involved in drilling and also determine the water level on different locations

April, 2021 - **Self Optimal Environment Control with minimum energy consumption for Greenhouse environ-**
Dec, 2021 **ment**, ***Sponsor:*** *Electronics and Telecommunications Research Institute (ETRI), South Korea.*
Description: Use the IoT device (Raspberry pi) and deploy tensorflow based DL model to predict the environment condition (Temperature, Humidity and CO_2) for time (t+1). The IoT device send the data to the server and server will apply Differential Evaluation (DE) based optimization technique to minimize the energy consumption by considering the outdoor climate condition and energy price.

Jan, 2021 - April, 2021	**Realtime Situation Reporting using YOLO**, *Sponsor:* *Jeju National University, South Korea.* **Description:** "Developed a system to identify object types, sizes, and their distances from a camera. The objective was to generate real-time descriptive reports on the immediate environment and object positions relative to the camera. The simulation results are here SM1, SM2

Development Projects

Android Development	**Developed more than ten android applications**, *Front-end activity design, back-end java development.* **Language and Tools:** Java, XML, SQL, Firebase
Web Development	**Developed more than 5 web applications**, *Front-end design using HTML,CSS, bootstrap and jQuery and backend using PhP, Python and SQL.* **Language and Tools:** Php, Python, HTML, CSS, jQuery, JavaScript and bootstrap

Publications

Summary

- Total publication = **30**
- SCI indexed (IF) publications = **29**
- Book Chapters = **1**
- Cumulative Impact Factor = **123.5**
- Corresponding author = **3**
- Survey Papers: **2**

Research Papers

2023 Khan, A. N., **Rizwan, A.**, Ahmad, R., Jin, W., Khan, Q. W., Lim, S., & Kim, D. (2023). Hetero-FedIoT: A Rule-Based Interworking Architecture for Heterogeneous Federated IoT Networks. **IEEE Internet of Things Journal**. **Impact Factor = 10.23**

2023 **Rizwan, A.**, Ahmad, R., Khan, A. N., Xu, R., & Kim, D. H. (2023). Intelligent digital twin for federated learning in AIoT networks. **Internet of Things**, 100698. **Impact Factor = 5.711**

2023 Khan, A. N., **Rizwan, A.**, Ahmad, R., Khan, Q. W., Lim, S., & Kim, D. H. (2023). A precision-centric approach to overcoming data imbalance and non-IIDness in federated learning. **Internet of Things**, 100890. **Impact Factor = 5.711**

2023 Khan, Q. W., Kim, B. W., Ahmed, R., **Rizwan, A**., Khan, A. N., Kim, K., & Kim, D. H. (2023). Predictive Modeling of Water Table Depth, Drilling Duration, and Soil Layer Classification using Adaptive Ensemble Learning for Cost-Effective Percussion Water Borehole Drilling. **IEEE Access**. **Impact Factor = 3.367**

2023 Shah, S. M. A. H., Shah, S. F. H., Ullah, A., **Rizwan, A**., Atteia, G., & Alabdulhafith, M. (2023). Arabic Sentiment Analysis and Sarcasm Detection using Probabilistic Projections Based Variational Switch Transformer. **IEEE Access**. **Impact Factor = 3.367**

2023 Khan, A. N., **Rizwan, A**., Ahmad, R., & Kim, D. H. (2023). An OCF-IoTivity enabled smart-home optimal indoor environment control system for energy and comfort optimization. **Internet of Things**, 22, 100712. **Impact Factor = 5.711**

2023 Khan, A. N., Kim, B. W., **Rizwan, A**., Ahmad, R., Iqbal, N., Kim, K., & Kim, D. H. (2023). A New Method for Determination of Optimal Borehole Drilling Location Considering Drilling Cost Minimization and Sustainable Groundwater Management. **ACS Omega**. **Impact Factor = 4.132**

2022 **Rizwan, A.**, Khan, A. N., Ahmad, R., & Kim, D. H. (2022). Optimal environment control mechanism based on OCF connectivity for efficient energy consumption in greenhouse. **IEEE Internet of Things Journal**, 10(6), 5035-5049. **Impact Factor = 10.23**

2022 Malik, F., Khan, S., **Rizwan, A**., Atteia, G., & Samee, N. A. (2022). A Novel Hybrid Clustering Approach Based on Black Hole Algorithm for Document Clustering. **IEEE Access**, 10, 97310-97326. **Impact Factor = 3.367**

2022 Khan, M. S., **Rizwan, A**., Faisal, M. S., Ahmad, T., Khan, M. S., & Atteia, G. (2022). Identification of Review Helpfulness Using Novel Textual and Language-Context Features. **Mathematics**, 10(18), 3260. **Impact Factor = 2.59**

2022 Faisal, M. S., **Rizwan, A.**, Iqbal, K., Fasihuddin, H., Banjar, A., & Daud, A. (2022). Prediction of Movie Quality via Adaptive Voting Classifier. **IEEE Access**, 10, 81581-81596. **Impact Factor = 3.367**

2022 Yazdan, S. A., Ahmad, R., Iqbal, N., **Rizwan, A**., Khan, A. N., & Kim, D. H. (2022). An Efficient Multi-Scale Convolutional Neural Network Based Multi-Class Brain MRI Classification for SaMD. **Tomography**, 8(4), 1905-1927. **Impact Factor = 3.000**

2022 Iqbal, N., Khan, A. N., **Rizwan, A**., Qayyum, F., Malik, S., Ahmad, R., & Kim, D. H. (2022). Enhanced time-constraint aware tasks scheduling mechanism based on predictive optimization for efficient load balancing in smart manufacturing. **Journal of Manufacturing Systems**, 64, 19-39. **Impact Factor = 8.633**

2022 Khan, A. N., Iqbal, N., **Rizwan, A.**, Malik, S., Ahmad, R., & Kim, D. H. (2022). A Criticality-Aware Dynamic Task Scheduling Mechanism for Efficient Resource Load Balancing in Constrained Smart Manufacturing Environment. **IEEE Access**, 10, 50933-50946. **Impact Factor = 3.367**

2022 Khan, U., Khan, S., **Rizwan, A**., Atteia, G., Jamjoom, M. M., & Samee, N. A. (2022). Aggression Detection in Social Media from Textual Data Using Deep Learning Models. **Applied Sciences**, 12(10), 5083. **Impact Factor = 2.67**

2022 Ahmad, T., Faisal, M. S., **Rizwan, A**., Alkanhel, R., Khan, P. W., & Muthanna, A. (2022). Efficient Fake News Detection Mechanism Using Enhanced Deep Learning Model. **Applied Sciences 2022**, 12(3), 1743. **Impact Factor = 2.67**

2022 **Rizwan, A**., Khan, A. N., Iqbal, N., Ahmad, R., & Kim, D. H. (2021). Enhanced Optimization-Based Voting Classifier and Chained Multi-Objective Regressor for Effective Groundwater Resource Management. **IEEE Access 2021**, 9, 168329-168341. **Impact Factor = 3.367**

2021 **Rizwan, A**., Iqbal, N., Khan, A. N., Ahmad, R., & Kim, D. H. (2021). Toward effective pattern recognition based on enhanced weighted K-mean clustering algorithm for groundwater resource planning in point cloud. **IEEE Access 2021**, 9, 130154-130169. **Impact Factor = 3.367**

2021 Iqbal, N., Khan, A. N., **Rizwan, A**., Ahmad, R., Kim, B. W., Kim, K., & Kim, D. H. (2021). Groundwater level prediction model using correlation and difference mechanisms based on boreholes data for sustainable hydraulic resource management. **IEEE Access 2021**, 9, 96092-96113. **Impact Factor = 3.367**

2021 Iqbal, N., **Rizwan, A**., Khan, A. N., Ahmad, R., Kim, B. W., Kim, K., & Kim, D. H. (2021). Boreholes data analysis architecture based on clustering and prediction models for enhancing underground safety verification. IEEE Access, 9, 78428-78451. **Impact Factor = 3.367**

2021 Khan, A. N., Iqbal, N., **Rizwan, A**., Ahmad, R., & Kim, D. H. (2021). An ensemble energy consumption forecasting model based on spatial-temporal clustering analysis in residential buildings. **Energies 2021**, 14(11), 3020. **Impact Factor = 3.004**

2021 **Rizwan, A**., Iqbal, N., Ahmad, R., & Kim, D. H. (2021). WR-SVM model based on the margin radius approach for solving the minimum enclosing ball problem in support vector machine classification. Applied Sciences, 11(10), 4657. **Impact Factor = 2.67**

Survey Papers:

2023 Khan, S., **Rizwan, A**., Khan, A. N., Ali, M., Ahmed, R., & Kim, D. H. (2023). A multi-perspective revisit to the optimization methods of Neural Architecture Search and Hyper-parameter optimization for non-federated and federated learning environments. **Computers and Electrical Engineering**, 110, 108867. **Impact Factor = 4.3**

2023 Khan, Q. W., Khan, A. N., **Rizwan, A**., Ahmad, R., Khan, S., & Kim, D. H. (2023). Decentralized machine learning training: a survey on synchronization, consolidation, and topologies. **IEEE Access**. **Impact Factor = 3.367**

Corresponding Author Journal Articles:

2023 Asif, M. S., Faisal, M. S., Dar, M. N., Hamdi, M., Elmannai, H., **Rizwan, A**., & Abbas, M. (2023). Hybrid Deep Learning and Discrete Wavelet Transform-Based ECG Biometric Recognition for Arrhythmic Patients and Healthy Controls. Sensors, 23(10), 4635. **Impact Factor = 3.847**

2022 Nawaz, A., Abbas, Y., Ahmad, T., Mahmoud, N. F., **Rizwan, A**., & Samee, N. A. (2022, August). A Healthcare Paradigm for Deriving Knowledge Using Online Consumers' Feedback. In **Healthcare** (Vol. 10, No. 8, p. 1592). Multidisciplinary Digital Publishing Institute. **Impact Factor = 3.16**

2022 Samee, N. A., Ahmad, T., Mahmoud, N. F., Atteia, G., Abdallah, H. A., & **Rizwan, A**. (2022, December). Clinical Decision Support Framework for Segmentation and Classification of Brain Tumor MRIs Using a U-Net and DCNN Cascaded Learning Algorithm. In Healthcare (Vol. 10, No. 12, p. 2340). Multidisciplinary Digital Publishing Institute.

Book Chapters

2022 Khan, A. N., **Rizwan, A**, Jin, W., Ahmed, R., Le, A. N., & Kim, D. (2022). Optimizing Energy Consumption in Smart Homes Based on OCF Standard Connectivity. In Intelligent Systems and Networks (pp. 253-259). Springer, Singapore.

Under Review Articles

2023 **Rizwan, A** et al. Personalized Hierarchical Heterogeneous Federated Learning for Thermal Comfort Prediction in Smart Buildings, **Engineering Applications of Artificial Intelligence**

2023 **Rizwan, A** et al. Convergence Aware Federated Transfer Learning Method for Energy Consumption Prediction, **Heliyon**

2023 **Rizwan, A** et al. Optimal Environment Control and Fruits Delivery Tracking system using Blockchain for Greenhouse, **IEEE Internt of Things**

Professional Services

Journals: Contributed as a reviewer to the following journals
- IEEE IoT
- Applied Intelligence
- Applied Sciences
- Energies
- IEEE Access

Languages

English Fluent
Urdu Fluent

References

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