Zulfiqar Ahamd Khan

CURRICULUM VITAE

📞 (+82) 10 4833 2613 ✉️ zulfiqarahmad@ieee.org, zulfiqar@sju.ac.kr 📍 Sejong University, Seoul, South Korea

Education

SEP 2019-AUG 2024

Joint Master's and Ph.D.
Sejong University, Seoul, South Korea

Department of Software

Thesis: A Study of hybrid predictive models for power generation and consumption forecasting

CGPA: 4.41/4.5

AUG 2016 - AUG 2018

M.Sc. Computer Science
Islamia College Peshawar, Peshawar, Pakistan

Department of Computer Science

Thesis: Towards smart home automation using IoT-enabled edge-computing paradigm (DIP Lab prototype)

CGPA: 3.61/4

Research Experience

MAR 2023 - PRESENT

Senior Research Assistant
Intelligent Media Laboratory, Sejong University, Seoul, South Korea

- Leading and directing a dynamic research group specializing in cutting-edge fields such as Computer Vision, Energy Informatics, and Signal Processing.
- Providing partial supervision to Master and Ph.D. candidates, including managing Professor projects and ensuring compliance with project requirements.
- Demonstrating leadership in composing and crafting multi-year project proposals submitted to the National Research Foundation of Korea (NRF).
- Actively engaging with students, offering guidance and support in generating ideas, implementing projects, and processing research articles.
- Facilitating collaboration and knowledge exchange within the research group to foster a creative and innovative environment.
- Contributing to the advancement of the laboratory's research agenda through strategic planning and effective project management.

Sep 2019 - PRESENT

Partially supervising BS/MS students
Digital Image Processing Laboratory, Islamia College Peshawar, Peshawar, Pakistan

- Guiding implementation of image/video analyses and research articles.
- Providing technical support for advanced algorithm implementation in multiple projects.
- Conducting regular progress reviews and offering constructive feedback to enhance research quality.
- Facilitating workshops to improve students' skills in digital image processing techniques.

SEP 2019 – FEB 2023

Research Assistant
Intelligent Media Laboratory, Sejong University, Seoul, South Korea

- Leading R&D for diverse industrial and academic projects, fostering innovation and knowledge growth in the laboratory.
- Collaborating with senior Lab members to ensure smooth execution of project implementations and handling complex tasks.
- Actively participating in the hands-on project implementation, translating research concepts into practical outcomes.

MAR 2017– AUG 2029

Research Assistant
Digital Image Processing Laboratory, Islamia College Peshawar

- Overseeing research projects for Bachelor students, focusing on Energy Informatics, Smart Home Solutions, Resource-Constrained Programming, and IoT.
- Crafting project proposals to secure funding and resources for the laboratory's ongoing initiatives.
- Actively participating in events and workshops to enhance knowledge exchange and stay updated on the latest advancements in the field.

SEP 2019– PRESENT

Research Collaborations
- Actively collaborating with research teams from diverse countries, including Saudi Arabia, Portugal, the UK, Spain, Brazil, and Pakistan, fostering international partnerships.
- Participating in collaborative publications and joint presentations at international Journals.
- Expanding the network of research collaborations by establishing connections with institutions and researchers worldwide.

Participated Projects

SEP 2019– PRESENT

Development of Ensemble Methods Based XAI Energy Platform for Effective Energy Consumption Pattern
(2019M3F2A1073179) ▯ **National Research Foundation of Korea (NRF)**

- Developed an intelligent AI-based anomaly detection and recognition system for assisting the urban in case of anomalous events in surveillance environments.
- Published research papers on anomaly detection and recognition as primary author in reputed journals (Future Generation Computer Systems and Knowledge-Based Systems).

SEP 2019– PRESENT

Anomaly Behaviour Recognition for Accident Prevention in the Connected Vision Environment
(2023R1A2C1005788) National Research Foundation of Korea (NRFK)

- | Developed an intelligent AI-based anomaly detection and recognition system for assisting the urban in case of anomalous events in surveillance environments.
- |Published research papers on anomaly detection and recognition as primary author in reputed journals (Future Generation Computer Systems and Knowledge-Based Systems).

SEP 2019– PRESENT

Development of Ensemble Methods Based XAI Energy Platform for Effective Energy Consumption Pattern
(2019M3F2A1073179) National Research Foundation of Korea (NRFK)

- | Developed an intelligent AI-based anomaly detection and recognition system for assisting the urban in case of anomalous events in surveillance environments.
- |Published research papers on anomaly detection and recognition as primary author in reputed journals (Future Generation Computer Systems and Knowledge-Based Systems).

SEP 2019– PRESENT

Multi-view Video Data Analysis Technology for Smart City based Intelligent.
(2019R1A2B5B01070067) National Research Foundation of Korea (NRF)

- | Developed an intelligent AI-based anomaly detection and recognition system for assisting the urban in case of anomalous events in surveillance environments.
- |Published research papers on anomaly detection and recognition as primary author in reputed journals (Future Generation Computer Systems and Knowledge-Based Systems).

Awards & Honors

SEP 2023
Best Paper Award
Next Generation Computing Conference, Best Western Premier Hotel, Jeju, South Korea

SEP 2019
100% Study Scholarship
Sejong University, Seoul, South Korea, for Joint Master's and Ph.D. Degree

AUG 2019
Winner of Business Plan Competition
Office of Research, Innovation and Commercialization (ORIC), Islamia College Peshawar, Peshawar, KPK, Pakistan

DEC 2019
100% Study Scholarship
Islamia College Peshawar, Pakistan for M.Sc. Degree

Journal Publications

2024
1. **Z. A. Khan**, T. Hussain, W. Ullah, and S. W. Baik, " A Trapezoid Attention Mechanism for Power Generation and Consumption Forecasting ", *IEEE Transactions on Industrial Informatics*. **[Early access]** IF: 12.3, Q1, Top: 1%

2. **Z. A. Khan**, S. A. Khan, T. Hussain, and S. W. Baik, "DSPM: Dual sequence prediction model for efficient energy management in micro-grid," *Applied Energy*, vol. 356, p. 122339, 2024. IF: 11.2, Q1, Top: 6%

3. H. Khan, T. Hussain, S. U. Khan, **Z. A. Khan**, and S. W. Baik, "Deep multi-scale pyramidal features network for supervised video summarization," *Expert Systems with Applications*, vol. 237, p. 121288, 2024. IF: 8.5, Q1, Top: 7%

2023
4. T. Khan, **Z. A. Khan**, and C. Choi, "Enhancing real-time fire detection: an effective multi-attention network and a fire benchmark," *Neural Computing and Applications*, pp. 1-15, 2023. IF: 6.0, Q2, Top: 28%

5. H. Yar, W. Ullah, **Z. A. Khan**, and S. W. Baik, "An Effective Attention-based CNN Model for Fire Detection in Adverse Weather Conditions," *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 206, pp. 335-346, 2023. IF: 12.7, Q1, Top: 1%

6. H. Yar, **Z. A. Khan**, F. U. M. Ullah, W. Ullah, and S. W. Baik, "A modified YOLOv5 architecture for efficient fire detection in smart cities," *Expert Systems with Applications*, vol. 231, p. 120465, 2023. IF: 8.5, Q1, Top: 7%

7. W. Ullah, F. U. M. Ullah, **Z. A. Khan**, and S. W. Baik, "Sequential Attention Mechanism for Weakly Supervised Video Anomaly Detection," *Expert Systems with Applications*, p. 120599, 2023. IF: 8.5, Q1, Top: 7%

8. **Z. A. Khan** et al., "Modelling Electricity Consumption During the COVID19 Pandemic: Datasets, Models, Results and a Research Agenda," *Energy and Buildings*, p. 113204, 2023. IF: 7.20, Q1, Top: 5%

9. **Z. A. Khan**, T. Hussain, and S. W. Baik, "Dual stream network with attention mechanism for photovoltaic power forecasting," *Applied Energy*, vol. 338, p. 120916, 2023. IF: 11.4, Q1, Top: 5%

2022
10. **Z. A. Khan**, T. Hussain, F. U. M. Ullah, S. K. Gupta, M. Y. Lee, and S. W. Baik, "Randomly initialized CNN with densely connected stacked autoencoder for efficient fire detection," *Engineering Applications of Artificial Intelligence*, vol. 116, p. 105403, 2022. IF: 7.80, Q1, Top: 5%

11. **Z. A. Khan**, T. Hussain, I. U. Haq, F. U. M. Ullah, and S. W. Baik, "Towards efficient and effective renewable energy prediction via deep learning," *Energy Reports*, vol. 8, pp. 10230-10243, 2022. IF: 4.97, Q2, Top: 47%

12. W. Ullah, T. Hussain, **Z. A. Khan**, U. Haroon, and S. W. Baik, "Intelligent dual stream CNN and echo state network for anomaly detection," *Knowledge-Based Systems*, vol. 253, p. 109456, 2022. IF: 8.14, Q1, Top: 13%

13. A. Hussain, **Z. A. Khan**, T. Hussain, F. U. M. Ullah, S. Rho, and S. W. Baik, "A hybrid deep learning-based network for photovoltaic power forecasting," *Complexity*, vol. 2022, 2022. IF: 2.12, Q2, Top: 26%

14. **Z. A. Khan** et al., "Efficient short-term electricity load forecasting for effective energy management," *Sustainable Energy Technologies and Assessments*, vol. 53, p. 102337, 2022. IF: 7.63,Q2, Top: 27%

15. H. Yar, T. Hussain, M. Agarwal, **Z. A. Khan**, S. K. Gupta, and S. W. Baik, "Optimized dual fire attention network and medium-scale fire classification benchmark," *IEEE Transactions on Image Processing*, vol. 31, pp. 6331-6343, 2022. IF: 11.04, Q1, Top: 4%

16. K. Muhammad et al., "WEENet: an intelligent system for diagnosing COVID-19 and lung cancer in IoMT environments," *Frontiers in oncology*, vol. 11, p. 811355, 2022. IF: 5.7, Q1, Top: 32%

17. **Z. A. Khan**, T. Hussain, and S. W. Baik, "Boosting energy harvesting via deep learning-based renewable power generation prediction," *Journal of King Saud University-Science*, vol. 34, no. 3, p. 101815, 2022. IF: 4.01, Q1, Top: 17%

2021
18. S. U. Khan, I. U. Haq, Z**. A. Khan**, N. Khan, M. Y. Lee, and S. W. Baik, "Atrous convolutions and residual GRU based architecture for matching power demand with supply," *Sensors*, vol. 21, no. 21, p. 7191, 2021. IF: 3.57, Q1, Top: 21%

19. H. Yar, A. S. Imran, **Z. A. Khan**, M. Sajjad, and Z. Kastrati, "Towards smart home automation using IoT-enabled edge-computing paradigm," *Sensors*, vol. 21, no. 14, p. 4932, 2021. IF: 3.27 Q1, Top: 23%

20. W. Ullah, A. Ullah, T. Hussain, **Z. A. Khan**, and S. W. Baik, "An efficient anomaly recognition framework using an attention residual LSTM in surveillance videos," *Sensors*, vol. 21, no. 8, p. 2811, 2021. IF: 3.27 Q1, Top: 23%

2020
Z. A. Khan, A. Ullah, W. Ullah, S. Rho, M. Lee, and S. W. Baik, "Electrical energy prediction in residential buildings for short-term horizons using hybrid deep learning strategy," Applied *Sciences*, vol. 10, no. 23, p. 8634, 2020. IF: 11.4, Q1, Top: 20%

21. M. Sajjad et al., "A novel CNN-GRU-based hybrid approach for short-term residential load forecasting," *IEEE Access*, vol. 8, pp. 143759-143768, 2020. IF: 2.47 Q2, Top: 34%

22. **Z. A. Khan**, T. Hussain, A. Ullah, S. Rho, M. Lee, and S. W. Baik, "Towards efficient electricity forecasting in residential and commercial buildings: A novel hybrid CNN with a LSTM-AE based framework," *Sensors*, vol. 20, no. 5, p. 1399, 2020. IF: 3.74, Q1, Top: 17%

Peer Review Journal Articles
1. **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Hikmat Yar, Waseem Ullah, Sung Wook Baik "Optimized Cross Module Attention Network and Database for Fire Detection" (Submitted to Expert Systems with Applications Journal)

2. Taimoor Khan, **Zulfiqar Ahmad Khan,** Fath U Min Ullah, Hikmat Yar, Waseem Ullah, Sung Wook Baik "Attention Enhanced Dual Stream Network with Advanced Feature Selection for Power Forecasting" (Submitted to Expert Systems with Applications Journal)

1. Hikmat Yar, **Zulfiqar Ahmad Khan,** Chang Choi "A Modified Vision Transformer Architecture with Scratch Learning Capabilities for Effective Fire Detection" (Major revision submitted Expert Systems with Applications Journal)

2. Hikmat Yar, Fath U Min Ullah, **Zulfiqar Ahmad Khan**, Waseem Ullah, Shagufta Henna, Sang Il Yoon, Mi Young Lee, Sung Wook Baik "EFNet-CSM: An Attention-Enhanced CNN for Accurate Fire Detection" (Submitted to Ain Shams Engineering Journal)

3. Hikmat Yar, **Zulfiqar Ahmad Khan**, Waseem Ullah, Samee Ullah Khan, Habib Khan, Min Je Kim, Sung Wook Baik "AVRNet: A Unified Deep Supervised Network for Effective Animal Voice Recognition" (Submitted to Information Processing and Management)

4. Hikmat Yar, **Zulfiqar Ahmad Khan**, Nasir Rahim, Waseem Ullah, Min Je Kim, Sung Wook Baik "Attention Enhanced YOLOV8 and a Benchmark for Fire Detection in Smart Surveillance and Remote Sensing " (Ready to submit)

5. Hikmat Yar, **Zulfiqar Ahmad Khan**, Imad Iqbal, Waseem Ullah, Min Je Kim, Sung Wook Baik "An Efficient Deep Learning Architecture for Effective Fire Detection in Smart Surveillance " (Submitted to Image and Vision Computing)

6. Adnan Hussain, Waseem Ullah, Noman Khan, **Zulfiqar Ahmad Khan**, Min Je Kim, Sung Wook Baik ""TDS-Net: Transformer Enhanced Dual-Stream Network for Video Anomaly Detection " (Submitted to Expert Systems with Applications Journal)

7. Waseem Ullah, Fath U Min Ullah, **Zulfiqar Ahmad Khan**, and Sung Wook Baik, Min Je Kim, Sung Wook Baik ""Ensemble Feature learning with Spatiotemporal Share Attention Memory for Anomaly Detection". (Submitted to IEEE Transactions on Cybernetics)

8. Waseem Ullah, **Zulfiqar Ahmad Khan**, Hikmat Yar and Sung Wook Baik ""A Dual Stream Attention Network for real world Anomalies Recognition " (Submitted to IEEE Transactions on Circuits and Systems for Video Technology)

9. Waseem Ullah, **Zulfiqar Ahmad Khan**, Hikmat Yar and Sung Wook Baik ""Anomaly Recognition and Localization in Surveillance System " (Submitted to Engineering Applications of Artificial Intelligence)

10. Fath U Min Ullah, Khan Muhammad, **Zulfiqar Ahmad Khan**, Sung Wook Baik ""Multi-Networks Fusion Strategy for Intelligent Violence Detection in Video Surveillance " (Submitted to IEEE Transactions on Big Data)

Conferences
1. **Zulfiqar Ahmad Khan**, Waseem Ullah, Hikmat Yar, Noman Khan, Min Je Kim and Sung Wook Baik "Dataset Standardization for Effective Solar Power Forecasting: A Comprehensive Analysis" The 9th International Conference on Next Generation Computing (ICNGC 2023) Danang, Vietnam.

2. Noman Khan, Waseem Ullah, **Zulfiqar Ahmad Khan**, Adnan Hussain, Min Je Kim, Sang Il Yoon and Sung Wook Baik, "Comparative Analysis of Solar Power Generation Forecasting Models for Identical Latitude Countries Data". The 9th International Conference on Next Generation Computing (ICNGC 2023) Danang, Vietnam.

3. **Zulfiqar Ahmad Khan**, Noman Khan, Su Min Lee, Sang Il Yoon, Mi Young Lee and Sung Wook Baik, "Solar Power Prediction using Dual Stream CNN-LSTM Architecture" Korea Next Generation Computing Society Spring Conference 2022.

4. Habib Khan, **Zulfiqar Ahmad Khan**, Waseem Ullah, Min Jee Kim, Mi Young Lee, Sung Wook Baik, "Efficient vehicle detection in aerial scenes" Korea Next Generation Computing Society Spring Conference 2022.

5. Muhammad Munsif, Habib Khan, **Zulfiqar Ahmad Khan**, Altaf Hussain, Fath U Min Ullah, Mi Young Lee and Sung Wook Baik, "PV-ANet: Attention-Based Network for Short-term Photovoltaic Power Forecasting" The 8th International Conference on Next Generation Computing 2022.

6. Su Min Lee, Min Je Kim, Samee Ullah Khan, Zulfiqar Ahmad Khan, Noman Khan, Mi Young Lee and Sung Wook Baik, "Deep Learning framework for intelligent surveillance video analytics" The 7th International Conference on Next Generation Computing 2021.

7. **Zulfiqar Ahmad Khan**, Waseem Ullah, Amin Ullah, Seungmin Rho, Mi Young Lee, Sung Wook Baik, "An Adaptive Filtering Technique for Segmentation of Tuberculosis in Microscopic Images" NLPIR 2020: 2020 4th International Conference on Natural Language Processing and Information Retrieval.

Patents
1. BAIK, Sung-Wook, RHO, Seung-Min, LEE, Mi-Young, **Zulfiqar Ahmad Khan**, Tanveer Hussain, and Amin Ullah, "Power consumption prediction system of residential and commercial building using hybrid convolution neural network and method thereof" **Registration No:** 1025005480000 （Korean Patent)

1. BAIK, Sung-Wook, LEE, Mi-Young, Waseem Ullah, Tanveer Hussain, and **Zulfiqar Ahmad Khan**, "Anomaly recognition method and system based on LSTM" **Registration No:** 1026012330000

2. BAIK, Sung-Wook, LEE, Mi-Young, **Zulfiqar Ahmad Khan**, Tanveer Hussain, Kim Minje, "Method for predicting renewable energy consumption and production based on deep learning and apparatus thereof" **Application No:** 1020220061428 (Submitted)

3. BAIK, Sung-Wook, LEE, Mi-Young, Altaf Hussain, **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Kim Minje, and Lee Sumin "Method for predicting renewable energy consumption and production based on deep learning and apparatus thereof" **Registration No:** 1025335080000

4. BAIK, Sung-Wook, LEE, Mi-Young, **Zulfiqar Ahmad Khan**, Kim Minje, Yoon Sangil, and Lee Sumin "Method for predicting energy production and consumption data using double sequence deep learning model, and apparatus thereof" **Registration No:** 1025218070000

5. BAIK, Sung-Wook, LEE, Mi-Young, **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Kim Minje, Yoon Sangil, and Lee Sumin "method for predicting energy consumption and production based on using hybrid convolutional neural network and regression neural network and apparatus thereof" **Registration No:** 1025218080000

Technical Skills
Programming and Development
- [**Expert**] MATLAB (Image processing and computer vision toolbox)
- [**Expert**] Python (OpenCV, NumPy, Scikit-learn, Pandas, Matplotlib)
- [**Expert**] CUDA installation and GPU processing (Window and Ubuntu)
- [**Intermediate**] Java (basic programming)
- [**Beginner**] C, C++

Deep Learning Framework
- [**Expert**] Keras, TensorFlow (Data loaders, Neural Network, Transformer)
- [**Intermediate**] PyTorch (Tensors, Data loaders, Neural networks, Transformers)
- [**Beginner**] Caffe and Caffe2

Research Writing and Visualization
- [**Expert**] Microsoft Word
- [**Expert**] LaTeX
- [**Expert**] Microsoft Power Point
- [**Intermediate**] Origin-pro

Operating System
- [Expert] Microsoft Window
- [Expert] Ubuntu

Member of Reviewer Board in Multiple Publisher (49+ reviews)
IEEE
- IEEE Transactions on Cybernetics
- IEEE Transactions on Industrial Informatics
- IEEE Access

Elsevier
- Journal of King Saud University - Computer and Information Sciences
- Engineering Application of Artificial Intelligence
- Knowledge Based System.
- Information Processing and Management

Springer
- Artificial Intelligence Review
- Cluster Computing
- Energy Efficiency
- International Journal of Machine Learning and Cybernet
- Human-centric Computing and Information Sciences
- Stochastic Environmental Research and Risk Assessment

Other
- Complexity
- PLOSE ONE
- Applied Sciences
- Atmosphere
- Forecasting

- Information
- Sensors
- Materials
- Sustainability
- Scientific Report
- IET Generation, Transmission & Distribution
- IET Renewable Energy
- Australian Journal of Electrical and Electronic Engineering

Languages

English **– Fluent**
Urdu **– Fluent**
Pashto **– native speaker**

References

Sung Wook Baik - Ph.D. Supervisor
- Full Professor and Director of Intelligent Media Laboratory (IMLab).
- Department of Software, Sejong University, Seoul, South Korea
- Email: sbaik@sejong.ac.kr