

Zulfiqar Ahmad Khan

Postdoctoral Fellow (WASP), Department of Computing Science
Umeå University, Umeå, Sweden

zulfiqar.khan@umu.se

+46 76 970 43 40

Google Scholar | ORCID | Umeå University

RESEARCH PROFILE

I am a researcher in AI and deep learning, focusing on computer vision, energy forecasting, edge and resource-efficient AI, and federated learning. I am currently a postdoctoral researcher in the Department of Computing Science at Umeå University, Sweden, through the Wallenberg AI, Autonomous Systems and Software Program (WASP), where I contribute to research projects, co-supervise PhD students, and support research team coordination. During my PhD, I served as Coordinator of the Intelligent Media Laboratory (IMLab), leading a research team of eight members and contributing to research projects, publications, project proposals, and student supervision.

RESEARCH METRICS

49	14	3000+	25	30+	6
Publications	First-author papers	Citations	h-index	i10-index	Korean patents

EDUCATION

Sep 2019 – Feb 2025	Joint Master's and Ph.D. , Department of Software, Sejong University, Seoul, South Korea Thesis: <i>A Study of Spatiotemporal Feature Analysis using Deep Hybrid Models for Power Forecasting</i>
Sep 2016 – Aug 2018	M.Sc. in Computer Science , Islamia College Peshawar, Pakistan Thesis: <i>Towards Smart Home Automation using IoT-enabled Edge-Computing Paradigm (DIPLab Prototype)</i>
Aug 2014 – Aug 2016	B.Sc. in Computer Science , University of Malakand, Dir Lower, Khyber Pakhtunkhwa, Pakistan

RESEARCH EXPERIENCE

May 2025 – present	Postdoctoral Researcher (WASP) , Department of Computing Science, Umeå University, Sweden <ul style="list-style-type: none">– Researching and implementing open-set recognition methods for computer vision.– Designing vision transformer architectures with spiking neural networks for energy-efficient visual processing.– Developing federated learning pipelines for privacy-preserving computer vision on edge devices.– Developing efficient algorithms for real-time fire detection.– Co-supervising PhD students and mentoring students in research ideation, algorithm implementation, and manuscript preparation.
Mar 2025 – Apr 2025	Postdoctoral Researcher , BrainAI Lab, Kyungpook National University, Daegu, South Korea <ul style="list-style-type: none">– Developed deep learning models for short-term energy forecasting and smart-grid optimization.– Conducted experiments and evaluated model performance for energy forecasting applications.
Jul 2024 – Mar 2025	IMLab Coordinator , Sejong University, Seoul, South Korea <ul style="list-style-type: none">– Led a research team of eight members working on energy informatics, computer vision, and signal processing.– Co-supervised Master's and PhD students on research planning, algorithm development, experimentation, and manuscript preparation.– Mentored students in research idea development, algorithm implementation, and experimental evaluation.– Contributed to multi-year research proposals submitted to the National Research Foundation of Korea (NRF).
Sep 2019 – Jun 2024	Research Assistant , Intelligent Media Laboratory, Sejong University, Seoul, South Korea <ul style="list-style-type: none">– Conducted research and development across multiple projects, contributing to algorithm development, experimentation, and publications.– Collaborated with senior researchers on algorithm implementation and experimental evaluation.– Implemented research methods and prototypes and evaluated their performance.
Mar 2017 – Aug 2019	Research Assistant , Digital Image Processing Laboratory, Islamia College Peshawar, Pakistan <ul style="list-style-type: none">– Supervised bachelor-level research projects in energy informatics, computer vision, and signal processing.

- Prepared research project proposals to support funding applications and laboratory initiatives.
- Participated in research events and workshops to support knowledge exchange.

RESEARCH PROJECTS

Contributed to NRF- and IITP-funded projects in AI, computer vision, energy forecasting, anomaly detection, and materials informatics: algorithm development, project coordination, publications, patents, and project reporting.

May 2025 – present	Wallenberg AI, Autonomous Systems and Software Program (WASP) Knut and Alice Wallenberg Foundation
Mar 2025 – Apr 2025	Brain-Inspired AI Application National Research Foundation of Korea (NRF) and Institute of Information and Communications Technology Planning and Evaluation (IITP)
Sep 2024 – Feb 2025	Materials Synthesis Data Hub National Research Foundation of Korea (NRF)
Apr 2024 – Dec 2024	AI Policy Simulation for Population-Declining Regions Institute of Information and Communications Technology Planning and Evaluation (IITP)
Mar 2023 – Feb 2025	Anomaly Detection for Accident Prevention National Research Foundation of Korea (NRF)
Oct 2019 – Dec 2023	Ensemble Learning and XAI for Energy Analysis National Research Foundation of Korea (NRF)

AWARDS & HONORS

Feb 2025	Outstanding Researcher Award , Sejong University, Seoul, South Korea
Sep 2023	Best Paper Award , Next Generation Computing Conference, Jeju, South Korea
Sep 2019	Full Scholarship, Joint Master's and Ph.D. Program , Sejong University, Seoul, South Korea
Aug 2019	Winner, Business Plan Competition , ORIC, Islamia College Peshawar, Pakistan
Dec 2019	Full Scholarship, M.Sc. in Computer Science , Islamia College Peshawar, Pakistan

RESEARCH RANKINGS & RECOGNITION

2024 – 2025	Top 2% Scientist , Updated Science-Wide Author Databases of Standardized Citation Indicators (2024, 2025, 2026)
2021 – 2025	Scholarly Index Research Rankings , source <ul style="list-style-type: none"> – Fire Detection and Safety Systems: World Rank 14 of 2,458 (top 0.57%); South Korea Rank 3 of 51. – Energy Load and Power Forecasting: World Rank 170 of 12,721 (top 1.4%); South Korea Rank 6 of 20. – Solar Radiation and Photovoltaics: World Rank 178 of 8,779 (top 2.1%); South Korea Rank 3 of 21.

PUBLICATIONS

Journal Articles

2026

- [J1] [AIoT-Enabled Dual-Phase Framework for Industrial Anomaly Detection and Recognition](#). Adnan Hussain, **Zulfiqar Ahmad Khan**, Hikmat Yar, Sung Wook Baik. *IEEE Internet of Things Journal*.
- [J2] [A Unified Deep Supervised Network for Effective Animal Voice Recognition](#). Hikmat Yar, **Zulfiqar Ahmad Khan**, Waseem Ullah, Samee Ullah Khan, Habib Khan, Min Je Kim, Sung Wook Baik. *CMES – Computer Modeling in Engineering & Sciences*.
- [J3] [Multi-model structure-agnostic framework for enhanced materials discovery in engineering informatics](#). Altaf Hussain, Muhammad Munsif, **Zulfiqar Ahmad Khan**, Kaleem Ullah, Sung Wook Baik. *Advanced Engineering Informatics*.
- [J4] [Deep hybrid network with additive attention for accurate population forecasting](#). Hikmat Yar, Adnan Hussain, **Zulfiqar Ahmad Khan**, Min Je Kim, Sung Wook Baik. *Soft Computing*.
- [J5] [A novel deep learning framework for battery performance prediction over the operational lifespan](#). Hikmat Yar, **Zulfiqar Ahmad Khan**, Adnan Hussain, Sang Il Yoon, Seoa Kim, Jungwook Choi, Chan Mi Jeon, Huisu Jeung, Kyungjung Kwon, Sung Wook Baik. *Journal of Energy Storage*.

- [J6] Class-incremental learning network for real-time anomaly recognition in surveillance environments. Adnan Hussain, Waseem Ullah, Noman Khan, **Zulfiqar Ahmad Khan**, Hikmat Yar, Sung Wook Baik. *Pattern Recognition*.
- 2025**
- [J7] Optimized Cross Module Attention Network and Database for Fire Detection. **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Hikmat Yar, Waseem Ullah, Sung Wook Baik. *Pattern Recognition*.
- [J8] EFNet-CSM: EfficientNet with a Modified Attention Mechanism for Effective Fire Detection. Hikmat Yar, Fath U Min Ullah, **Zulfiqar Ahmad Khan**, Min Je Kim, Sung Wook Baik. *Knowledge-Based Systems*.
- [J9] Edge-assisted framework for instant anomaly detection and cloud-based anomaly recognition in smart surveillance. Adnan Hussain, Noman Khan, **Zulfiqar Ahmad Khan**, Hikmat Yar, Min Je Kim, Sung Wook Baik. *Engineering Applications of Artificial Intelligence*.
- [J10] Dual stream deep attention networks for annual population projection. Adnan Hussain, Hikmat Yar, Noman Khan, **Zulfiqar Ahmad Khan**, Min Je Kim, Sung Wook Baik. *Pattern Analysis and Applications*.
- [J11] Hierarchical attention-based framework for enhanced prediction and optimization of organic and inorganic material synthesis. Muhammad Munsif, Altaf Hussain, **Zulfiqar Ahmad Khan**, Min Je Kim, Sung Wook Baik. *Advanced Engineering Informatics*.
- [J12] Enhancing real-time fire detection: An effective multi-attention network and a fire benchmark. Taimoor Khan, **Zulfiqar Ahmad Khan**, Chang Choi. *Neural Computing and Applications*.
- 2024**
- [J13] DSPM: Dual sequence prediction model for efficient energy management in micro-grid. **Zulfiqar Ahmad Khan**, Shabbir Ahmad Khan, Tanveer Hussain, Sung Wook Baik. *Applied Energy*.
- [J14] A modified vision transformer architecture with scratch learning capabilities for effective fire detection. Hikmat Yar, **Zulfiqar Ahmad Khan**, Tanveer Hussain, Sung Wook Baik. *Expert Systems with Applications*.
- [J15] TDS-Net: Transformer enhanced dual-stream network for video anomaly detection. Adnan Hussain, Waseem Ullah, Noman Khan, **Zulfiqar Ahmad Khan**, Min Je Kim, Sung Wook Baik. *Expert Systems with Applications*.
- [J16] An efficient deep learning architecture for effective fire detection in smart surveillance. Hikmat Yar, **Zulfiqar Ahmad Khan**, Imad Rida, Waseem Ullah, Min Je Kim, Sung Wook Baik. *Image and Vision Computing*.
- [J17] Deep multi-scale pyramidal features network for supervised video summarization. Habib Khan, Tanveer Hussain, Samee Ullah Khan, **Zulfiqar Ahmad Khan**, Sung Wook Baik. *Expert Systems with Applications*.
- 2023**
- [J18] A Trapezoid Attention Mechanism for Power Generation and Consumption Forecasting. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Waseem Ullah, Sung Wook Baik. *IEEE Transactions on Industrial Informatics*.
- [J19] Dual stream network with attention mechanism for photovoltaic power forecasting. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Sung Wook Baik. *Applied Energy*.
- [J20] Modelling Electricity Consumption During the COVID-19 Pandemic: Datasets, Models, Results and a Research Agenda. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Amin Ullah, Waseem Ullah, Javier Del Ser, Khan Muhammad, Muhammad Sajjad, Sung Wook Baik. *Energy and Buildings*.
- [J21] An Effective Attention-based CNN Model for Fire Detection in Adverse Weather Conditions. Hikmat Yar, Waseem Ullah, **Zulfiqar Ahmad Khan**, Sung Wook Baik. *ISPRS Journal of Photogrammetry and Remote Sensing*.
- [J22] A modified YOLOv5 architecture for efficient fire detection in smart cities. Hikmat Yar, **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Waseem Ullah, Sung Wook Baik. *Expert Systems with Applications*.
- [J23] Sequential Attention Mechanism for Weakly Supervised Video Anomaly Detection. Waseem Ullah, Fath U Min Ullah, **Zulfiqar Ahmad Khan**, Sung Wook Baik. *Expert Systems with Applications*.
- 2022**
- [J24] Randomly initialized CNN with densely connected stacked autoencoder for efficient fire detection. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Fath U Min Ullah, Suneet Kumar Gupta, Mi Young Lee, Sung Wook Baik. *Engineering Applications of Artificial Intelligence*.
- [J25] Towards efficient and effective renewable energy prediction via deep learning. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Ijaz Ul Haq, Fath U Min Ullah, Sung Wook Baik. *Energy Reports*.
- [J26] Efficient short-term electricity load forecasting for effective energy management. **Zulfiqar Ahmad Khan**, Amin Ullah, Ijaz Ul Haq, Mohamed Hamdy, Gerardo Maria Mauro, Khan Muhammad, Mohammad Hijji, Sung Wook Baik. *Sustainable Energy Technologies and Assessments*.
- [J27] Boosting energy harvesting via deep learning-based renewable power generation prediction. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Sung Wook Baik. *Journal of King Saud University – Science*.
- [J28] Intelligent dual stream CNN and echo state network for anomaly detection. Waseem Ullah, Tanveer Hussain,

Zulfiqar Ahmad Khan, Umair Haroon, Sung Wook Baik. *Knowledge-Based Systems*.

- [J29] A hybrid deep learning-based network for photovoltaic power forecasting. Altaf Hussain, **Zulfiqar Ahmad Khan**, Tanveer Hussain, Fath U Min Ullah, Seungmin Rho, Sung Wook Baik. *Complexity*.
- [J30] Optimized dual fire attention network and medium-scale fire classification benchmark. Hikmat Yar, Tanveer Hussain, Mohit Agarwal, **Zulfiqar Ahmad Khan**, Suneet Kumar Gupta, Sung Wook Baik. *IEEE Transactions on Image Processing*.
- [J31] WEENet: an intelligent system for diagnosing COVID-19 and lung cancer in IoMT environments. Khan Muhammad, Hayat Ullah, **Zulfiqar Ahmad Khan**, Abdul Khader Jilani Saudagar, Abdullah AlTameem, Mohammed AlKhatham, Muhammad Badruddin Khan, Mozaherul Hoque Abul Hasanat, Khalid Mahmood Malik, Mohammad Hijji, Muhammad Sajjad. *Frontiers in Oncology*.

2021

- [J32] Atrous convolutions and residual GRU based architecture for matching power demand with supply. Samee Ullah Khan, Ijaz Ul Haq, **Zulfiqar Ahmad Khan**, Noman Khan, Mi Young Lee, Sung Wook Baik. *Sensors (MDPI)*.
- [J33] Towards smart home automation using IoT-enabled edge-computing paradigm. Hikmat Yar, Ali Shariq Imran, **Zulfiqar Ahmad Khan**, Muhammad Sajjad, Zenun Kastrati. *Sensors (MDPI)*.
- [J34] An efficient anomaly recognition framework using an attention residual LSTM in surveillance videos. Waseem Ullah, Amin Ullah, Tanveer Hussain, **Zulfiqar Ahmad Khan**, Sung Wook Baik. *Sensors (MDPI)*.

2020

- [J35] Electrical energy prediction in residential buildings for short-term horizons using hybrid deep learning strategy. **Zulfiqar Ahmad Khan**, Amin Ullah, Waseem Ullah, Seungmin Rho, Mi Young Lee, Sung Wook Baik. *Applied Sciences*.
- [J36] Towards efficient electricity forecasting in residential and commercial buildings: A novel hybrid CNN with a LSTM-AE based framework. **Zulfiqar Ahmad Khan**, Tanveer Hussain, Amin Ullah, Seungmin Rho, Mi Young Lee, Sung Wook Baik. *Sensors (MDPI)*.
- [J37] A novel CNN-GRU-based hybrid approach for short-term residential load forecasting. Muhammad Sajjad, **Zulfiqar Ahmad Khan**, Amin Ullah, Tanveer Hussain, Waseem Ullah, Mi Young Lee, Sung Wook Baik. *IEEE Access*.

Conference Papers

- [C1] GeoSwIn: Hierarchical Representation Learning and a Large-Scale Earth Observation Benchmark. Muhammad Fayaz, **Zulfiqar Ahmad Khan**, Lien Minh Dang, Hyeonjoon Moon. *CVPR 2026 Workshop* (accepted).
- [C2] TinySEED: A Lightweight Transformer Architecture with Channel-Attention for DDoS Detection. Yinuo Zhang, **Zulfiqar Ahmad Khan**, Monowar Bhuyan. *ACM SAC 2026* (accepted).
- [C3] Catastrophic Forgetting Resilient One-Shot Incremental Federated Learning. Obaidullah Zaland, **Zulfiqar Ahmad Khan**, Monowar Bhuyan. *ICBDA 2026* (accepted).
- [C4] Dual Deep Learning Network for Abnormal Action Detection. Fath U Min Ullah, **Zulfiqar Ahmad Khan**, Sung Wook Baik, Estefania Talavera, Saeed Anwar, Khan Muhammad. *IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS)*, 2024.
- [C5] Dataset Standardization for Effective Solar Power Forecasting: A Comprehensive Analysis. **Zulfiqar Ahmad Khan**, Waseem Ullah, Hikmat Yar, Noman Khan, Min Je Kim, Sung Wook Baik. *9th International Conference on Next Generation Computing (ICNGC)*, Danang, Vietnam, 2023.
- [C6] Comparative Analysis of Solar Power Generation Forecasting Models for Identical Latitude Countries Data. Noman Khan, Waseem Ullah, **Zulfiqar Ahmad Khan**, Adnan Hussain, Min Je Kim, Sang Il Yoon, Sung Wook Baik. *9th International Conference on Next Generation Computing (ICNGC)*, Danang, Vietnam, 2023.
- [C7] Solar Power Prediction using Dual Stream CNN-LSTM Architecture. **Zulfiqar Ahmad Khan**, Noman Khan, Su Min Lee, Sang Il Yoon, Mi Young Lee, Sung Wook Baik. *Korea Next Generation Computing Society Spring Conference*, 2022.
- [C8] Efficient vehicle detection in aerial scenes. Habib Khan, **Zulfiqar Ahmad Khan**, Waseem Ullah, Min Je Kim, Mi Young Lee, Sung Wook Baik. *Korea Next Generation Computing Society Spring Conference*, 2022.
- [C9] PV-ANet: Attention-Based Network for Short-term Photovoltaic Power Forecasting. Muhammad Munsif, Habib Khan, **Zulfiqar Ahmad Khan**, Altaf Hussain, Fath U Min Ullah, Mi Young Lee, Sung Wook Baik. *8th International Conference on Next Generation Computing*, 2022.
- [C10] Disasters Scenes Classification Based on Unmanned Aerial Vehicles Using Lightweight CNN. Altaf Hussain, Samee Ullah Khan, Fath U Min Ullah, **Zulfiqar Ahmad Khan**, Mi Young Lee, Sung Wook Baik. *7th International Conference on Next Generation Computing*, 2021.
- [C11] Fire detection through effective vision transformers. Hikmat Yar, Tanveer Hussain, **Zulfiqar Ahmad Khan**, Mi Young Lee, Sung Wook Baik. *Korean Society for Next Generation Computing Journal*, 17(5):21–30, 2021.

- [C12] An Adaptive Filtering Technique for Segmentation of Tuberculosis in Microscopic Images. **Zulfiqar Ahmad Khan**, Waseem Ullah, Amin Ullah, Seungmin Rho, Mi Young Lee, Sung Wook Baik. *4th International Conference on Natural Language Processing and Information Retrieval (NLPPIR)*, 2020.

PATENTS (KOREA)

- [P1] Power consumption prediction system of residential and commercial building using hybrid convolution neural network and method thereof. Sung-Wook Baik, Seung-Min Rho, Mi-Young Lee, **Zulfiqar Ahmad Khan**, Tanveer Hussain, Amin Ullah. Reg. No. 1025005480000.
- [P2] Anomaly recognition method and system based on LSTM. Sung-Wook Baik, Mi-Young Lee, Waseem Ullah, Tanveer Hussain, **Zulfiqar Ahmad Khan**. Reg. No. 1026012330000.
- [P3] Method for predicting renewable energy consumption and production based on deep learning and apparatus thereof. Sung-Wook Baik, Mi-Young Lee, Altaf Hussain, **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Minje Kim, Sumin Lee. Reg. No. 1025335080000.
- [P4] Method for predicting energy production and consumption data using double sequence deep learning model, and apparatus thereof. Sung-Wook Baik, Mi-Young Lee, **Zulfiqar Ahmad Khan**, Minje Kim, Sangil Yoon, Sumin Lee. Reg. No. 1025218070000.
- [P5] Method for predicting energy consumption and production based on hybrid convolutional neural network and regression neural network and apparatus thereof. Sung-Wook Baik, Mi-Young Lee, **Zulfiqar Ahmad Khan**, Fath U Min Ullah, Minje Kim, Sangil Yoon, Sumin Lee. Reg. No. 1025218080000.
- [P6] Method for predicting renewable energy consumption and production based on deep learning and apparatus thereof. Sung-Wook Baik, Mi-Young Lee, **Zulfiqar Ahmad Khan**, Tanveer Hussain, Minje Kim. Appl. No. 1020220061428 (submitted).

TECHNICAL SKILLS

Programming	Python, C++ , PHP
Deep learning	PyTorch, TensorFlow, Keras
Computer vision	OpenCV, scikit-image, Pillow
Data analysis	Pandas, NumPy, Matplotlib, Seaborn; time-series analysis, regression models
ML methods	Supervised and unsupervised learning, active learning, incremental learning, federated learning
IoT & databases	MQTT, Raspberry Pi, Arduino; MySQL, SQLite, XAMPP
Tools	Git, GitHub, Jupyter, Spyder, MATLAB Simulink, W TeX, Microsoft Office

ACADEMIC SERVICE

Peer review	60+ reviews (record on ORCID) for IEEE Transactions on Cybernetics; IEEE Transactions on Industrial Informatics; Engineering Applications of Artificial Intelligence; Knowledge-Based Systems; Information Processing and Management; Artificial Intelligence Review; Journal of King Saud University – Computer and Information Sciences; Cluster Computing; Energy Efficiency; Stochastic Environmental Research and Risk Assessment; Scientific Reports; IET Generation, Transmission & Distribution; IET Renewable Energy.
-------------	---

REFERENCES

Prof. Sung Wook Baik <i>Ph.D. Supervisor</i> Professor and Director, IMLab Department of Software Sejong University, Seoul, Korea sb Baik@sejong.ac.kr +82 10 2439 9436	Dr. Monowar Bhuyan <i>Postdoc Advisor</i> Assistant Professor Dept. of Computing Science Umeå University, Sweden monowar.bhuyan@umu.se +46 90 786 67 05	Dr. Amin Ullah <i>Former Lab Coordinator</i> Senior AI/ML Software Engineer Boeing Research & Technology Seattle, WA, USA qamin3797@gmail.com +1 541 908 7580
--	---	---