Engr. Dr. Muhammad Waqar Akram

CAS-TWAS President's Fellowship PhD Graduate
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https://scholar.google.com/citations?user=m9Lvzb4AAAAJ&hl=en
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Date of Birth: 02-May-1990
Nationality: Pakistan
Languages: English, Chinese, Urdu

ACADEMIC QUALIFICATIONS

Ph.D. Precision Instrument and Machinery	University of Science and Technology of China, China	2020
M.Sc. (Hons.) Agricultural Engineering	University of Agriculture Faisalabad, Pk	2015
B.Sc. Agricultural Engineering	University of Agriculture Faisalabad, Pk	2012

PROFESSIONAL EXPERIENCE

1- **Lecturer** 12-Mar-2026 to Date
(Department of Farm Machinery and Power)
University of Agriculture Faisalabad, Pakistan
Responsibilities: Teaching and Research

2- **Post Doctoral Research Fellow** 11-Apr-2024 to 09-Mar-2026
(School of Renewable Energy/School of Electrical and Power Engineering)
Hohai University, China.
Responsibilities: Research and Supervising students

3- **Visiting Professor** 15-Nov-2025 to 14-Dec-2025
(Engineering Faculty)
Sh. Yessenov Caspian University of Technology and Engineering
Aktau, Kazakhstan
Responsibilities: Research

4- **Lecturer** 08-Sep-2014 to 06-Mar-2024 (incl. 04 years study leave)
(Department of Farm Machinery and Power)

University of Agriculture Faisalabad, Pakistan

Responsibilities: Teaching and Research

5- **Assistant Executive Engineer/Lab Engineer** 06-Sep-2013 to 07-Sep-2014

(Department of Irrigation and Drainage)

University of Agriculture, Faisalabad.

Responsibilities: Administration and Teaching

CONSULTING EXPERIENCE

1- Advisory Services 2024-2025

Antai Digital Energy Technology Co. Ltd., Changzhou, China

(Projects: Autonomous Photovoltaic Monitoring, Photovoltaic Power Prediction, and Solar Irradiance Forecast)

PERSONAL/RESEARCH STATEMENT

I have multiple years of teaching and research experience in Machine/Deep learning and vision, Computer Modeling, and Precision Instruments integration/application to address complex engineering challenges, with applications in Renewable Energy and Agro-Mechanical systems. I worked in collaboration with different national and international research groups and remained involved in different R&D projects of multidisciplinary nature and published more than 35 SCI papers including 6 highly cited publications (Total 2450+ citations and h-index of 19). I also contributed open datasets and models/methods for artificial intelligence (AI) applications. My research activities cover design, modeling/simulation, development, and experiments. Currently, I am engaged in research related to Generative AI models and Machine/Deep learning for power forecasting and inspection of Photovoltaic systems. My scholarly/research interests are in AI, Generative AI, edge AI, computer modeling, and precision mechanics integration/application for enhancing efficiency, performance and reliability of renewable energy systems, focusing efficient and trustworthy Machine learning with reduced carbon foot print, cost and explainability. My future goals are to progressively enhance my abilities and effective contribution to addressing sustainable energy and environment challenges through involvement in effective teaching, research and development in a challenging and stimulating environment.

AWARDS AND HONOURS

1. Provincial level winner in the sector of natural resources, National Idea Bank 2022, Pakistan.
2. Awarded CAS-TWAS President’s fellowship award 2016 for PhD.
3. Earned four merit scholarships during graduation awarded by University of Agriculture, Faisalabad.

EDITORIAL/OTHER MEMBERSHIPS/AFFILIATIONS

1. Academic Editor, PLOS ONE Journal, Public Library of Science, San Francisco, California, USA (Jan 2025-Present)
2. Editorial Board member, International Journal of Sustainable and Green Energy (August 14, 2025 to Present)
3. Advisory Board member, Pakistan Journal of Engineering and Technology, The University of Lahore, Pakistan (Jul 2023-Present)
4. Professional Member, International Solar Energy Society (ISES), Germany.
5. Member, International Association of Engineers (IAENG).
6. Member, IAENG Society of Artificial Intelligence.
7. Member, Asian Council of Science Editors (ACSE).
8. External member of the Board of Studies of the Department of Intelligent Systems, Faculty of Information Technology, The University of Lahore from September 13, 2023 to Date.
9. Registered member of Pakistan Engineering Council.

Ph.D. THESIS / RESEARCH WORK

Akram, M. W. 2020. Thermo-mechanical assessment and defect detection in Photovoltaic modules. Ph.D. Thesis, Department of Precision Machinery and Instrumentation, School of Engineering Science, University of Science and Technology of China, Hefei, China.

M.Sc. (Hons.) THESIS / RESEARCH WORK

Akram, M. W. 2015. Design and Development of small scale walk-behind type sugarcane cutter. M.Sc. (Hons.) Thesis, Department of Farm Machinery and Power, Faculty of Agricultural Engineering & Technology, University of Agriculture, Faisalabad, Pakistan.

BOOK CHAPTERS

1. Akram M. W., Jin Y., Li G., Changan Z., Aiman J. 2018. Solar-Powered Drip Irrigation System. In: Nižetić S., Papadopoulos A. (eds) The Role of Exergy in Energy and the Environment. Green Energy and Technology. Springer, Cham. https://doi.org/10.1007/978-3-319-89845-2_38.

2. Akram M. W., A. Khaliq. 2017. Groundwater Management. In: A. Bakhsh, M. Rafiq Ch. (eds) Applied Irrigation Engineering. University of Agriculture Faisalabad press, Pakistan. ISBN 978-969-8237-97-4. http://onlinebooks.uaf.edu.pk/Chapter.aspx?ChapId=76#7s8d6f87.

RESEARCH PAPERS (Selective)

h-index 19 & Total Citations = 2450 +

1. M. W. Akram, J. Bai. 2026. Synergistic Integration of Text-to-Image Generation and Deep Learning for Photovoltaic System Inspection. Energy, 342 (139611). https://doi.org/10.1016/j.energy.2025.139611
2. B. Wang, J. Bai, Y. Zhang, M. W. Akram, C. Cui, G. Conibeer, S. Zheng. 2026. Maximizing net present value of bifacial PV systems: improved optical modeling and parameter optimization. Progress in Photovoltaics: Research and Applications. https://doi.org/10.1002/pip.70091
3. S. Zai, A. Ahmad, S. Jadoon, A. U. Rehman, M. W. Akram, et al. 2026. Analyzing the impact of novel charge transport materials on the photovoltaic properties of Ba_3SbI_3-based perovskite solar cell using SCAPS-1D modelling. Optical and Quantum Electronics 58, 87. https://doi.org/10.1007/s11082-026-08678-7
4. M. W. Akram*, J. Bai. 2025. Defect Detection in Photovoltaic Modules based on Image-to-Image Generation and Deep Learning. Sustainable Energy Technologies and Assessments, 82 (104441). https://doi.org/10.1016/j.seta.2025.104441
5. M. W. Akram, J. Bai, C. Xuan, X. Xiaotuo, J. Hu, S. Wu. 2025. Advancing Photovoltaic Cells Defect Detection in Electroluminescence Images Through Exploring Multiple Object Detectors. Solar Energy Materials and Solar Cells, 292 (113777). https://doi.org/10.1016/j.solmat.2025.113777
6. S. Zheng, J. Bai, M. W. Akram. 2025. An enhanced method for design and simulation of building integrated photovoltaic plants incorporating photovoltaic resource assessment. Building Simulation, 18: 1087-1101. https://doi.org/10.1007/s12273-025-1252-8
7. A. Ahmad, I. Javed, C. Zhu, M. B. Rasheed, M. W. Akram, et al. 2024. Prediction of Temperature Variability on Power Transmission Line Parameters using Intelligent Approaches. Pertanika Journal of Science and Technology. https://doi.org/10.47836/pjst.32.6.05
8. Z. Jin, H. Xu, G. Li, X. Zhao, Z. Liu, D. Wu, M. W. Akram. 2024. Performance study of organic photovoltaic/thermal system with synergistic effect of photocatalytic and thermal catalytic technology. Solar Energy, 271 (112456). https://doi.org/10.1016/j.solener.2024.112456
9. M. Z. Akram, Y. Deng, M. W. Akram, M. Faisal, Q. Jia. 2023. Effects of Premixed and Diffusion Conditions on the Iso-Octane/ammonia and Iso-Octane/ethanol Flames. Combustion Science and Technology. https://doi.org/10.1080/00102202.2023.2295328
10. M. Nauman, M. Tayyab, M. Faheem, K. Ikram, M. W. Akram, M. Asif, M. M. Omar. 2023. Designing and performance evaluation of continuously stirring anaerobic batch reactor for biomethane production from biowaste. Biomass Conversion and Biorefinery. https://doi.org/10.1007/s13399-023-04203-y
11. M.U. Khan, M.M. Rehman, M. Sultan, T. Rehman, U. Sajjad, M. Yousaf, H.M. Ali, M.A. Bashir, M.W. Akram, M. Ahmad, M. Asif. 2022. Key prospects and major

development of hydrogen and bioethanol production. International Journal of Hydrogen Energy, 47 (62), 26265-26283. https://doi.org/10.1016/j.ijhydene.2022.06.224

12. G. Li, J. Li, Z. Dai, M. W. Akram. 2022. Modelling and analysis of a novel hydrogen production approach by full spectrum solar energy. Energy Conversion and Management, 263 (115694). https://doi.org/10.1016/j.enconman.2022.115694
13. M. W. Akram, G. Li, Y. Jin, X. Chen. 2022. Failures of Photovoltaic modules and their Detection: A Review. Applied Energy, 313 (118822). https://doi.org/10.1016/j.apenergy.2022.118822
14. S. Ashfaq, M. Nadeem, M. Yamin, T. Afzal, M. W. Akram, R. Anam, A. Mehboob. 2022. Performance evaluation of downdraft gasifier with syngas cleaning system. Sarhad Journal of Agriculture, 38(4): 1322-1331. https://dx.doi.org/10.17582/journal.sja/2022/38.4.1322.1331
15. M. Z. Akram, F. Ma, M. W. Akram. 2022. A numerical approach to elucidate the combustion and emission characteristics of n-dodecane under hydrogen enrichment. Energy Conversion and Management, 2255 (115294). https://doi.org/10.1016/j.enconman.2022.115294
16. A. Ahmad, Y. Jin, C. Zhu, I. Javed, A. Maqsood, M. W. Akram. 2020. Photovoltaic cell defect classification using convolutional neural network and support vector machine. IET Renewable Power Generation, 14 (14), 2693-2702. https://doi.org/10.1049/iet-rpg.2019.1342
17. M. Faheem, L. Jizhan, M. W. Akram, M. U. Khan, P. Yongphet, M. Tayyab, M. Awais. 2020. Design optimization, fabrication, and performance evaluation of solar parabolic trough collector for domestic applications. Energy Sources, Part A: Recovery, Utilization, and Environmental Effects. https://doi.org/10.1080/15567036.2020.1806407
18. M. W. Akram, G. Li, Y. Jin, X. Chen, C. Zhu, I. Shauket, A. Ahmad. 2020. Defect detection and degradation analysis in Photovoltaic modules using thermography, spectroscopy and current-voltage measurements, and quantitative assessment of their impact. Energy technology, 8 (7), 2000100. https://doi.org/10.1002/ente.202000100
19. M. W. Akram, G. Li, Y. Jin, C. Zhu, A. Javaid, M. Z. Akram, M. U. Khan. 2020. Study of manufacturing and hotspot formation in cut cell and full cell PV modules. Solar Energy, 203, 247-259. https://doi.org/10.1016/j.solener.2020.04.052
20. G. Jin, T. Zhu, M. W. Akram, Y. Jin, C. Zhu. 2020. An adaptive anti-noise neural network for bearing fault diagnosis under noise and varying load conditions. IEEE Access, 8, 74793 – 74807. https://doi.org/10.1109/ACCESS.2020.2989371
21. M. W. Akram, G. Li, Y. Jin, X. Chen, C. Zhu, A. Ahmad. 2020. Automatic detection of photovoltaic module defects in infrared images with isolated and develop-model transfer deep learning. Solar Energy, 198, 175-186. https://doi.org/10.1016/j.solener.2020.01.055
22. G. Li, Q. Xuan, M. W. Akram, Y. G. Akhlaghi, H. Liu, S. Shittu. 2020. Building integrated solar concentrating systems: A review. Applied Energy, 260, 114288. https://doi.org/10.1016/j.apenergy.2019.114288
23. A. Ahmad, Y. Jin, C. Zhu, I. Javed, M. W. Akram, N. A. Buttar. 2020. Support vector machine based prediction of photovoltaic module and power station parameters. International Journal of Green Energy. https://doi.org/10.1080/15435075.2020.1722131

24. M. W. Akram, L. Guiqiang, Y. Jin, X. Chen, C. Zhu, X. Zhao, A. Khaliq, M. Faheem, A. Ahmad. 2019. CNN based automatic detection of photovoltaic cell defects in electroluminescence images. Energy, 189, 116319. https://doi.org/10.1016/j.energy.2019.116319
25. M. W. Akram, L. Guiqiang, Y. Jin, X. Chen, C. Zhu, X. Zhao, M. Aleem, A. Ahmad. 2019. Improved outdoor thermography and processing of infrared images for defect detection in PV modules. Solar Energy, 190, 549–560. https://doi.org/10.1016/j.solener.2019.08.061
26. Ashfaq A., Y. Jin, C. Zhu, I. Javed, M. W. Akram. 2020. Investigating tension in overhead high voltage power transmission line using finite element method. Electrical Power and Energy Systems, 114, 105418. https://doi.org/10.1016/j.ijepes.2019.105418
27. Guiqiang L.*, M. W. Akram*, Y. Jin, X. Chen, C. Zhu, A. Ahmad, R. H. Arshad, X. Zhao. 2019. Thermo-mechanical behavior assessment of smart wire connected and busbar PV modules during production, transportation, and subsequent field loading stages. Energy, 168, 931-945. https://doi.org/10.1016/j.energy.2018.12.002 (*Co first authors)
28. Guiqiang L., Y. Jin, M. W. Akram, X. Chen, and J. Ji. 2018. Application of bio-inspired algorithms in maximum power point tracking for PV systems under partial shading conditions – A review. Renewable and Sustainable Energy Reviews, 81, 840-873. https://doi.org/10.1016/j.rser.2017.08.034
29. M. Rizwan, M. W. Akram, M. Aleem, and M. Waqas Sarwar. 2018. Modification and optimization of solar parabolic trough for steam generation. Journal of Global Innovations in Agricultural Sciences, 6(2), 55-60.
30. Guiqiang L., Y. Jin, M. W. Akram, and X. Chen. 2017. Research and current status of the solar photovoltaic water pumping system – A review. Renewable and Sustainable Energy Reviews, 79, 440-458. https://doi.org/10.1016/j.rser.2017.05.055

SAE TECHNICAL (Engineering Indexed)/CONFERENCE PAPERS

1. M. W. Akram, J. Bai, A. U. Rehman. 2025. Text-to-Image and Image-to-Image Augmentation and Classification of Defects in Photovoltaic Modules. Proceedings of the 42nd European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC) 2025, Pages 020164-001-020164-006, Bilbao, Spain. ISBN: 3-936338-93-0, DOI: 10.4229/EUPVSEC2025/3AV.2.37 https://userarea.eupvsec.org/proceedings/EU-PVSEC-2025/3AV.2.37/
2. A. Hina, M. Z. Akram, A. Shafa, M. W. Akram. 2025. The Numerical Study of Methane Flame Characteristics in the Ammonia/Air Environment at Sub-Atmospheric Pressure. SAE Technical Paper 2025-01-8450. https://doi.org/10.4271/2025-01-8450
3. M. Z. Akram, H. Rashid, Y. Deng, M. Aziz, Q. Zhu, M. W. Akram. 2024. NH3 and H2 impact on combustion and emission characteristics of i-C8H18 flame under premixed and diffusion conditions. SAE Technical Paper, 2024-01-2370. https://doi.org/10.4271/2024-01-2370
4. Akram, M. Z., M. Aziz, F. Ma, Y. Deng, M. W. Akram, A. Akhtar. 2023. Combustion characteristics of iso-octane/hydrogen flames under T and P effects up to near

flammability limits. SAE Technical Paper, 2023-01-0333. https://doi.org/10.4271/2023-01-0333
5. Akram, M. Z., F. Ma, U. Sultan, M. W. Akram, T. Rashid. 2022. CO2 and H2 effects on lean limits and combustion characteristics of ethanol flame. SAE Technical Paper, 2022-32-0001. https://doi.org/10.4271/2022-32-0001
6. Akram, M. W., Y. Jin, G. Li, M. Muzammil. 2017. Solar powered drip irrigation system. Proceedings of 9th International Exergy, Energy, and Environment Symposium (IEEES-9). Split, Croatia. ISBN 978-953-290-069-9.

DATASETS

1. Solar PVMEL-Solar PV module-level EL images data (2025). Electroluminescence (EL) images dataset of Photovoltaic (PV) modules (module-level data) for AI applications in Photovoltaic monitoring and inspection. Publicly available at https://www.kaggle.com/datasets/waqarakram/solar-pvmel-solar-pv-module-level-el-images-data and https://kaggle.com/datasets/b6ebe1ef566cc298a4173b697c121f1a49234762d24910982a530d73bd30a8ca
2. PV module EL classification data (2025). Electroluminescence (EL) images of Photovoltaic (PV) modules with classification labels for AI applications in Photovoltaic monitoring and inspection. Publicly available at https://www.kaggle.com/datasets/waqarakram/pv-module-el-classification-data and https://kaggle.com/datasets/5030370fea199c058d48d191041e0ef60ca711db7a2b9f5f036fc9f90f4edaf5
3. Text-to-image generated PV module EL images (2025). Synthetic text-to-image generated electroluminescence (EL) images dataset of Photovoltaic (PV) modules for AI applications in Photovoltaic monitoring and inspection. Publicly available at https://www.kaggle.com/datasets/waqarakram/text-to-image-generated-pv-module-el-images
4. Image-to-image generated PV module EL images (2025). Synthetic electroluminescence (EL) images dataset of Photovoltaic (PV) modules for AI applications in Photovoltaic monitoring and inspection. Publicly available at https://www.kaggle.com/datasets/waqarakram/solar-pvelm-synthetic-solar-pv-module-el-images

OPEN METHODS/MODELS

1. Text-to-image model “mwaqarakram/PVEL-Text-to-image-Generator-1” for generating electroluminescence (EL) images of normal and defective Photovoltaic modules (2025), available at Hugging Face platform on following link: https://huggingface.co/mwaqarakram/PVEL-Text-to-image-Generator-1

2. Text-to-image model “mwaqarakram/PVEL-Text-to-image-Generator-2” for generating electroluminescence (EL) images of normal and defective Photovoltaic modules (2025), available at Hugging Face platform on following link:

https://huggingface.co/mwaqarakram/PVEL-Text-to-image-Generator-2

INVITED SPEAKER/RESOURCE PERSON/TALK

1. Invited Lecture at "Science Day" in Sh. Yessenov Caspian University of Technology and Engineering organized by Department of Energy and Automation, Yessenov University, Kazakhstan on November 26, 2025.
2. Resource Person/Facilitator in three-day Capacity Development Training Program "Training of Trainers, Strengthening Agricultural Innovation Systems for Agricultural Machinery for Smallholders in Pakistan: TAP approaches and tools" under Food and Agriculture Organization of the United Nations (FAO) TAP-AIS Project held on December 11-13, 2023 at Islamabad, Pakistan.
3. Invited Speaker in 02 Days International Conference on "Precision and Sustainable Agriculture Under Climate Change (IPSAC-2023)" held at Khwaja Fareed University of Engineering and Information Technology (KFUEIT), Rahim Yar Khan on February 16-17, 2023.
4. Resource person in one-day seminar (1.0 CPD point) on "Mechanical Rice Transplanting and Practical Demonstration of Kubota Rice Transplanter" held on July 20, 2022 at University of Agriculture Faisalabad.
5. Resource person in "Training Program for Cotton Campaign 2022" held at the University of Agriculture, Faisalabad, Pakistan on May 31, 2022.
6. Resource person in One-day CPD activity on "Applications and Hands-on Training of Artificial Intelligence (AI) in Water, Food and Energy Sector" held at the University of Agriculture, Faisalabad, Pakistan on March 16, 2022.
7. Resource person in One-day CPD activity on "Establishing Science and Technology Parks in Pakistan" held at the University of Agriculture, Faisalabad, Pakistan on March 02, 2022.

CONFERENCE PRESENTATIONS

1. Conference paper poster presentation in the 42nd European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC) 2025 "M. W. Akram, J. Bai, A. U. Rehman. 2025. Text-to-Image and Image-to-Image Augmentation and Classification of Defects in Photovoltaic Modules", organized by WIP Renewable Energies, Germany held during September 22-26, 2025 in Bilbao, Spain.
2. Conference paper oral presentation in "9th International Exergy, Energy, and Environment Symposium (IEEES-9)" held in Split (Croatia) at the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split on May 14-17, 2017.

PROFESSIONAL SERVICE

1. Conference Session Chair in "10th International Conference on Clean Energy and Power Generation Technology (CEPGT 2025)" organized by the Jiangsu Photovoltaic Industry

Association and Hohai University, China held during December 19-21, 2025. Chaired the session *"Hydrogen Energy and Other New Energy Materials"*.

2. Technical committee member of 6th Asia Conference on Cognitive Engineering and Intelligent Interaction 2023 (CEII 2023), Hong Kong, China.
3. Reviewer of various web of science indexed journals.
4. Organized International workshop on "Renewable Energy Technologies for community development in Pakistan" held at University of Agriculture, Faisalabad from November 04-06, 2015 (role: committee member).

RESEARCH PROJECTS

1. "A Research Study on Synergistic Integration of Generative Image Models and Deep Learning for Photovoltaic Modules Inspection" under The Fundamental Research Funds for the Central Universities China Program, Project Number B250201205, 2025-26 (Worked as PI, Status: Completed).
2. "Modeling and simulation of multi-field coupled offshore photovoltaic systems and core components" Key Special project of Renewable Energy under the National Key Research and Development Program 2024 funded by the Ministry of Science and Technology of the People's Republic of China, Project Number 2024YFB4207004, 12-2024 to 11-2027 (Working as Member).
3. "Redesigning, fabrication and adoption of a self-propelled sugarcane stripper for improving labour productivity and sugar recovery" funded by Punjab Agricultural Research Board (PARB), Pakistan: Worked as a Team scientist (Status: Completed).
4. "Strengthening of AMRI Research and Development Capabilities in collaboration with UAF for fabrication of cost effective and efficient small Agriculture Implements for small farmers" under the ADP project of Agriculture Department, Government of the Punjab: Worked as Member (Status: Completed).
5. "A strategy for sustainable sewage sludge management with energy and organic fertilizer production" under National Research Program for Universities- NRPU: Worked as Team Member (Status: Ongoing).

TEACHING EXPERIENCE/COURSES

(1) Computer Modeling of Engineering Systems, (2) Artificial Intelligence in Engineering Systems, (3) Artificial Intelligence, (4) Instrumentation, (5) Metallurgy and Workshop Practices, (6) Manufacturing Engineering, (7) Product Design and Development, (8) Energy in Agriculture, (9) Farm Mechanization

STUDENTS SUPERVISION

1. 03 Master students (Supervised), 01 PhD student (Co-Supervised), 12 Master students (Co-Supervised), and 09 Bachelor final year projects (Supervised)
2. 01 PhD student and 01 Master student (Under Supervision/ Degree in progress)