KASHIF KHAN

kashif12@fel.zcu.cz | Research Portfolio | LinkedIn | Google Scholar | GitHub

8+ peer-reviewed journal and IEEE conference papers | **2 Best Paper Awards** | **Junior Researcher and PhD Student at UWB**

RESEARCH PROFILE

I am a Junior Researcher and PhD student at the University of West Bohemia (UWB), working at the intersection of machine learning, electrical engineering, and computational design. My current doctoral research focuses on **AI-assisted optimization of machine design**, with the objective of reducing the number and computational cost of high-fidelity numerical simulations. My broader expertise includes data-efficient surrogate modelling, RF and microwave device modelling, generalization beyond training regimes, uncertainty-aware learning, prognostics, and real-time engineering optimization.

EDUCATION

University of West Bohemia (UWB), Pilsen, Czech Republic 2026 – Present
PhD Student, Faculty of Electrical Engineering
Research focus: AI-assisted optimization of machine design using data-efficient surrogate models to minimize expensive numerical simulations.
Supervisor: Prof. Václav Šmídl

Nazarbayev University, Astana, Kazakhstan Aug. 2021 – Jun. 2023
MSc in Electrical & Computer Engineering (*Machine Learning Focus*)
Thesis: Development of Machine Learning-Based Modelling Techniques for Advanced RF Devices
CGPA: 3.21/4.0

University of Engineering & Technology (UET), Peshawar, Pakistan Aug. 2015 – Aug. 2019
BSc in Electrical Engineering
Thesis: Road Power Generation Using a Freewheel Mechanism
CGPA: 3.36/4.0

EXPERIENCE

University of West Bohemia (UWB), Pilsen, Czech Republic 2026 – Present
Junior Researcher and PhD Student *Faculty of Electrical Engineering*

- Conduct research on AI-assisted optimization of machine design, focusing on reducing the number and computational cost of high-fidelity numerical simulations.
- Develop data-efficient surrogate-modelling and optimization workflows that connect machine learning with physics-based engineering simulations.
- Investigate reliable model generalization, uncertainty-aware prediction, and efficient sampling strategies for computationally expensive engineering design spaces.
- Design reproducible experimental pipelines for model development, validation, benchmarking, and engineering interpretation.

Radio Frequency Research Team, Nazarbayev University Nov. 2021 – Jun. 2026
Research Assistant *Astana, Kazakhstan*

- **Machine Learning on Large Experimental Datasets:** Built end-to-end supervised-learning pipelines for multi-condition RF datasets covering bias, temperature, and frequency. Emphasized data integrity, leakage-proof splitting, controlled baselines, ablation studies, and reproducible reporting.
- **Interpolation and Extrapolation Reliability:** Designed evaluation protocols to quantify model reliability under previously unseen operating regimes for advanced RF devices, particularly GaN HEMTs. Benchmarked neural networks, XGBoost, and Gaussian Process Regression and tuned models using global optimization.
- **Surrogate Modelling and Experimental Validation:** Developed electromagnetic simulation → machine-learning surrogate → optimization workflows for microstrip-filter design using ADS and metaheuristic optimization. Validated optimized designs through fabrication and Vector Network Analyzer measurements.

Invest In Kids, Astana, Kazakhstan Feb. 2023 – Feb. 2026
Instructor

- Teach Python and applied machine learning, covering data preprocessing, model development, evaluation, interpretation, and iterative improvement.
- Supervise practical AI-system projects involving LLM agents and n8n automation, including Telegram chatbots, Google Sheets–connected pipelines, and tool-using assistants.
- Conduct code reviews and mentor students in reproducible workflows, technical documentation, experiment tracking, and project-based learning.

SELECTED PROJECTS & RESEARCH

- **AI-Assisted Optimization of Machine Design** *Surrogate Modelling, Engineering Optimization*
  Objective: Reduce dependence on computationally expensive high-fidelity numerical simulations during engineering design and optimization.
  Approach: Develop data-efficient surrogate models and optimization strategies that combine machine learning with physics-based simulation data.
  Current work: Investigating reliable surrogate construction, informative sampling, uncertainty-aware prediction, and robust optimization across complex machine design spaces.

- **Interpretable Transformer-Based Modelling for Turbofan RUL** *Transformers, Prognostics, Uncertainty*
  Problem: Accurate and interpretable remaining-useful-life prediction under changing operating regimes in turbofan engines.
  ML approach: Designed a lightweight, regime-aware Transformer integrating convolutional feature extraction, temporal attention, and uncertainty-aware prediction.
  Evaluation: Assessed prediction accuracy, cross-regime robustness, interpretability, uncertainty calibration, and inference latency.
  Outcome: Achieved competitive predictive performance with sub-millisecond inference while maintaining interpretability and robustness across operating regimes.

- **Neural Surrogate Modelling for High-Frequency Filter Design** *ANN, GWO, ADS, VNA*
  Problem: High-dimensional electromagnetic RF design involving computationally expensive simulations.
  ML approach: Trained ANN surrogate models to approximate electromagnetic responses and integrated surrogate inference with the Grey Wolf Optimizer for design-space exploration.
  Evaluation: Evaluated predictive accuracy, optimization efficiency, robustness across unseen geometries, and agreement with physical measurements.
  Outcome: Enabled rapid design iteration with sub-millisecond surrogate inference and validated the optimized design through fabrication and VNA measurements.

- **Extrapolation-Aware ML for GaN HEMT Behavioural Modelling** *XGBoost, GPR, Global Optimization*
  Problem: Reliable prediction of S-parameters under bias, temperature, and frequency conditions not observed during training.
  ML approach: Benchmarked neural networks, XGBoost, and Gaussian Process Regression using explicit interpolation and extrapolation data splits and global hyperparameter optimization.
  Evaluation: Studied generalization beyond training regimes, prediction stability, response consistency, and performance across sparse regions of the input space.
  Outcome: Optimized XGBoost models demonstrated strong extrapolation performance and consistent improvements over conventional baselines.

- **ML-Assisted Global MPPT under Partial Shading** *ANN, XGBoost, LightGBM, GPR*
  Problem: Non-convex and time-varying power optimization under partial-shading conditions in photovoltaic systems.
  ML approach: Benchmarked ANN, Random Forest, SVR, GPR, XGBoost, LightGBM, and CatBoost using physics-based synthetic data and a scale-invariant prediction target.
  Evaluation: Assessed tracking factor, inference latency, robustness, statistical significance, and real-time feasibility.
  Outcome: Achieved near-unity tracking efficiency with sub-millisecond inference using hybrid ML prediction and deterministic micro-refinement.

PUBLICATIONS

My publications focus on machine learning for complex physical systems, including surrogate modelling, reliability beyond training regimes, uncertainty-aware prediction, prognostics, and real-time engineering optimization.

Journal Articles

1. **K. Khan**, S. Husain, M. Hashmi, "GWO–ANN Based Surrogate Modeling for High-Frequency Microstrip Filter Design and Optimization," *Procedia Computer Science* (**Published; Elsevier; Scopus indexed**).
2. **K. Khan**, S. Husain, A. Jarndal, M. Hashmi, "Hybrid Machine Learning Framework for Performance Optimization of GaN HEMT Small-Signal Behavioral Models," *International Journal of Numerical Modelling: Electronic Networks, Devices and Fields* (**Published; Wiley; SCIE/Scopus**).
3. A. Umar, R. Debnath, D. Kumar, G. Gupta, V. Gali, P. K. Jamwal, **K. Khan**, "Enhanced Microgrid Management Using Sliding Mode Control with Blockchain-Enabled Smart Contracts for Uncertainty Regulation," *Energy Reports* (**Published; Elsevier; SCIE/Scopus**).
4. **K. Khan**, A. Umar, S. Husain, A. Khusro, M. Hashmi, P. K. Jamwal, "Machine Learning Assisted Maximum Power Point Tracking with Deterministic Micro-Refinement under Partial Shading Conditions," *Energy Reports* (**Under Review; Elsevier; SCIE/Scopus**).
5. **K. Khan**, M. Hasan, "Transformer+: An Efficient and Interpretable Transformer Framework for Turbofan Remaining Useful Life Prediction," *International Journal of Prognostics and Health Management* (**Under review; Elsevier; SCIE/Scopus**).

Conference Papers (IEEE Indexed)

1. **K. Khan**, S. Husain, A. Jarndal, M. Hashmi, "Development and Assessment of Machine Learning-Based Small-Signal Modeling Techniques for GaN HEMTs," *36th IEEE International Conference on Microelectronics (ICM)*, Doha, Qatar, Dec. 2024.
2. **K. Khan**, S. Husain, G. Nauryzbayev, M. Hashmi, "Evaluation of ANN, RBNN, and GRNN Models for High-Frequency GaN HEMT Behavioral Modeling up to 40 GHz," *IEEE Midwest Symposium on Circuits and Systems (MWSCAS)*, Springfield, USA, Aug. 2024.
3. **K. Khan**, S. Husain, G. Nauryzbayev, M. Hashmi, "Comparative Study of ANN and Metaheuristic-Optimized ML Models for GaN-on-Si HEMT Behavioral Modeling," *30th IEEE International Conference on Electronics, Circuits and Systems (ICECS)*, Istanbul, Türkiye, Dec. 2023, pp. 1–4.
4. **K. Khan**, S. Husain, G. Nauryzbayev, M. Hashmi, "Temperature-Dependent Machine Learning Models for GaN HEMT Small-Signal Behavior," *IEEE International Symposium on Networks, Computers and Communications (ISNCC)*, Doha, Qatar, Oct. 2023, pp. 1–6. *(**Best Paper Award**)*
5. S. Husain, **K. Khan**, G. Nauryzbayev, M. Hashmi, "Neural Network-Based Temperature-Dependent I–V Modeling of Microwave Transistors," *5th IEEE International Conference on Multimedia, Signal Processing and Communication Technologies (IMPACT)*, Aligarh, India, Dec. 2022, pp. 1–5. *(**Best Paper Award**)*

AWARDS AND ONLINE COURSES

- **Best Paper Award** — IEEE ISNCC, Doha, Qatar (2023).
- **Best Paper Award** — IEEE IMPACT, Aligarh, India (2022).
- **Abay Kunanbayev Fully Funded Scholarship** — MSc, Nazarbayev University.
- **Diya Pakistan Fully Funded Scholarship** — BSc, UET Peshawar.
- **Prime Minister's Laptop Award** — Academic excellence during BSc studies.
- **Goodwill Scholarship** — Peshawar Model Degree College.
- **Pre-training LLMs, Open-Source Models with Hugging Face, and Prompt Engineering for Developers** — DeepLearning.AI.
- **Data Science Tools** — IBM (DS0105EN), Certificate of Completion.
- **Deep Learning Fundamentals with Keras** — IBM (DL0101EN), Certificate of Completion.
- **Data Science with Python** — Simplilearn (Certificate 4405431).

TECHNICAL STRENGTHS

Machine Learning Expertise

- Supervised learning and sequence prediction
- Surrogate modelling for expensive simulations
- Physics-guided and hybrid ML pipelines

- Interpolation and extrapolation analysis
- Uncertainty-aware and probabilistic modelling
- Conformal prediction and Monte Carlo dropout

Models and Architectures

- MLP, CNN, RBNN, and GRNN models
- Transformer-based sequence models
- XGBoost, LightGBM, and Random Forest
- SVR and Gaussian Process Regression

Optimization and Evaluation

- Surrogate-assisted engineering optimization
- GWO, PSO, WOA, ALO, and hybrid methods
- Grid search and randomized search
- Leakage-proof splitting and ablation studies
- Statistical and robustness evaluation
- Latency-aware real-time assessment

Programming and Engineering Tools

- Python, C, and C++
- PyTorch, TensorFlow/Keras, and scikit-learn
- NumPy, Pandas, Matplotlib, and Jupyter
- MATLAB and Keysight ADS
- GPU-enabled experimentation
- Git and reproducible research workflows

RESEARCH & PROFESSIONAL SKILLS

- **Research Planning:** Methodology development, literature reviews, simulation design, data curation, leakage-proof evaluation, and reproducible experimentation.
- **Scientific Communication:** Research papers, technical reports, presentations, figures, tables, and communication for academic and interdisciplinary audiences.
- **Collaboration and Mentoring:** Independent research execution, interdisciplinary teamwork, teaching, technical supervision, and student mentoring.
- **Problem Solving:** Evidence-driven analysis, controlled baselines, ablation studies, interpretation, and iterative experimental improvement.
- **Leadership and Community Engagement:** Served as General Secretary at PASBAN Human Rights, Protection & Welfare Organization, coordinating meetings, records, operational workflows, and stakeholder communication.

LANGUAGES

- English: **IELTS 7.0 (CEFR C1)** — proficient in academic writing, research communication, teaching, and presentations.
- Pashto: Native Urdu: Native Russian: Basic