Mohamed Rayan Barhdadi

Doha, Qatar

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Research Interests

3D computer vision, multi-agent systems, AI for social good

Education

Texas A&M University, Qatar Campus — Aug 2023-Present
Bachelor of Science with Honors — Graduation: May 2027
Specialization: Electrical Engineering with minor in Mathematics

Under Review

MR Barhdadi, M Tuncel, E Serpedin, and H Kurban. *EMPATHIA: Multi-Faceted Human-AI Collaboration for Refugee Integration* . The 39th Annual Conference on Neural Information Processing Systems (NeurIPS), San Diego CA, USA, 2025.

Publications

MR Barhdadi, H Kurban, and H Alnuweiri. *PhysicsNeRF: Physics-Guided 3D Reconstruction from Sparse Views* . The 42nd International Conference on Machine Learning (ICML), Building Physically Plausible World Models, Vancouver, Canada 2025. *[Accepted]*

MR Barhdadi, FF Jaldurgam, and SKE Awadallah. *Advancing Transformer Diagnostics: A Statistical Analysis of a Publicly Available DGA Database* . The 21th CIGRE International Conference and 31st Exhibition for Electrical Equipment (GCC-CIGRE), Kuwait 2025. *[Accepted]*

Research Experience

Research Intern, with Dr. Halima Bensmail and Dr. Michael Aupetit — May 2025-Present
Artificial Intelligence Group, Qatar Computing Research Institute

- Creating a SOTA method for clustering high-dimensional data using deep generative models (RealNVP and coupling-based normalizing flows), and benchmarked its performance against existing unsupervised algorithms with automated hyperparameter selection.
- Building robust, reproducible evaluation protocols for unsupervised structure discovery and experimental design—currently preparing for ICLR main track submission.

Independent Lead Researcher — Mar 2025-Present
Advised by Dr. Hasan Kurban and Dr. Hussein Alnuweiri

- Developed PhysicsNeRF, a compact neural radiance field architecture for sparse-view 3D reconstruction, incorporating four physics-based constraints: depth ranking, geometric consistency, volumetric sparsity, and progressive regularization.
- Achieved 21.4 dB PSNR using only 8 input views; analyzed generalization gaps and collapse–recovery dynamics, with findings published at ICML 2025 (Physically Plausible World Models).

Research Collaborator, Undergraduate Research Experience Program — Jan 2025-Present
Qatar Research, Development and Innovation Council

- Enabled diagnostic tool deployment by standardizing and preprocessing transformer DGA datasets for compatibility with traditional and ML-based fault detection models
- Implemented scalable data filtration and formatting scripts to support confidence-based consensus analysis and improve model input reliability

Undergraduate Research Assistant, with Dr. Selma Awadallah — Feb 2024-Dec 2024
Power System Modeling and Analysis Laboratory, Electrical and Computer Engineering Department, Texas A&M University

- Led the creation of a publicly accessible DGA database of 743 transformers, published in GCC-CIGRE 2025, by designing a relational SQL schema, implementing standardized data acquisition across global sources, and applying rigorous preprocessing pipelines including format normalization, hash-based duplicate detection, and full diagnostic preservation.
- Conducted large-scale statistical modeling and correlation analysis of gas concentrations (H2, CH4, C2H4, C2H6, C2H2), developed a web-based query and visualization platform, and publicly released all code and data to support reproducible benchmarking and machine learning validation.

Teaching Experience

Mentor, High School Research Experience Program — Feb 2024-Dec 2024
Qatar Research, Development and Innovation Council in collaboration with Texas A&M University
Environmental Data Collection and Analysis Project

- Supervised long-term environmental data collection protocols using HOBO loggers and multi-parameter environmental sensor for temperature, wind patterns, and solar radiation over 10-month periods

- Coordinated systematic data acquisition campaigns and implemented quality assurance procedures for environmental monitoring research with statistical validation methods

Industry Experience

SLB Qatar Headquarter June 2025–Aug 2025
Engineering/Data Science Intern

- Developed a TL plugin/script to automate standardized cement and corrosion evaluation reports, integrating user-defined intervals, cement quality snapshots, and corrosion zonation studies (plots, tables) directly in Techlog, addressing a key bottleneck in well integrity reporting.
- Reduced report turnaround time from 2-3 days to a few minutes, driving internal efficiency gains across 8 GeoUnits and enabling potential external revenue of $\sim$ \$100k; facilitated bundling of auto-generated reports with acquisition deliverables for enhanced client value.

Awards

2025 Second Place (Global Phase) Invent for the Planet by Texas A&M University – \$2,500.
2025 First Place at the EC 3rd Undergraduate Research Retreat (Best Research Poster) – \$550.
2025 Woqod x Qatar Foundation Grant Award Recipient – \$10,000.
2025 First Place (Qatar Phase) Invent for the Planet by Texas A&M University Engineering – \$1,650.
2025 Best Prototype Award Invent for the Planet by Texas A&M University Engineering.
2025 Best Video Award Invent for the Planet by Texas A&M University Engineering.
2025 Awardee of Student Leadership Exchange Program (SLEP) Grant – \$2,000.
2024 Winner of Qatar Foundation Technology-Based Ideas Pitch Competition – \$11,000 investment.
2024 Awardee of the selective Undergraduate Research Experience Program (UREP 31-043-2-014) by Qatar Research Development and Innovation Council (QRDI) – \$1,500.
2024 2nd Place Texas A&M University Qatar Robotics Competition.
2024 Lead Organizer and Mentor in "Effective Humanitarian Engineering Solutions Workshop".
2023 Inducted in Engineering Honors Program at Texas A&M-Q.

Technical Skills

Programming Languages, Tools, Frameworks, Concepts:

- **Programming Languages:** Python, Julia, SQL, C Language, Verilog HDL, HTML, CSS.
- **Machine Learning and Data Analysis Libraries:** PyTorch, TensorFlow, CUDA, scikit-learn, Pandas, NumPy, Matplotlib, Seaborn, SciPy, SymPy.
- **Software Tools and IDEs:** Intel Quartus II, Jupyter Notebook, VS Code, MobaXterm, MySQL Workbench, phpMyAdmin, XAMPP, HOBOlink.
- **Design and Media Tools:** Blender, LaTeX, Adobe Suite (After Effects, Media Encoder, Photoshop, Illustrator), Microsoft Office Suite (Excel, Word, PowerPoint).

Leadership and Community Involvement

The Peace Club TAMU-Q, *Advisor*	Fall 2025-present
The Peace Club TAMU-Q, *President*	Spring 2025
The Peace Club TAMU-Q, *Vice-President*	Fall 2024
Qatar Foundation, *Student Orientation Leader*	Fall 2024
Qatar Foundation Convocation 24', *Student Volunteer*	Spring 2024
IEEE, *Student Member*	Fall 2023-Present
IEEE Student Chapter, *Class Representative*	Fall 2023-Spring 2024
Moroccan National Swimming Federation, *Instructor Volunteer*	Summer 2022

Languages

English (Fluent), French (Fluent), Arabic (Native)

References

Dr. Hasan Kurban
Assistant Professor of CS at Hamad Bin Khalifa University, **Email:** hkurban@hbku.edu.qa.

Dr. Halima Bensmail
Principal Scientist at the Qatar Computing Research Institute, **Email:** hbensmail@hbku.edu.qa.

Dr. Hussein Alnuweiri
Professor of EE at Texas A&M University Qatar, **Email:** alnuweiri@tamu.edu.

Dr. Ali Ghrayeb
IEEE Fellow and Professor of EE at Texas A&M University Qatar, **Email:** ali.ghrayeb@qatar.tamu.edu.

Dr. Selma Awadallah
Assistant Professor of EE at Texas A&M University Qatar, **Email:** selma.awadallah@tamu.edu.