

Emadeldeen Hamdan

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PROFESSIONAL SUMMARY

Ph.D. Candidate in Electrical and Computer Engineering (UIC) with a strong publication record across IEEE, IJCAI, SVIP, and ICIP venues, specializing in efficient deep learning architectures, computer vision, and foundation models. Experienced in designing and deploying CNN-, Transformer-, and Mamba-based systems for medical imaging and remote sensing, with a focus on model efficiency, GPU training, and hardware-aware deployment. Seeking a Research Scientist or a Post-Doctoral role.

EDUCATION

University of Illinois Chicago

Ph.D., Electrical and Computer Engineering. Researching efficient deep learning and computer vision methods for remote sensing and medical imaging, with a focus on lightweight AI architectures and foundation models. Chicago, IL
Jan. 2023 – Expected May 2027

University of Illinois Chicago

B.S., Electrical and Computer Engineering. Magna Cum Laude. Dean's List 2021, 2022. Chicago, IL
Sep. 2020 – May 2022

EXPERIENCE

Research Assistant, Machine and Hybrid Intelligence Lab

Northwestern University May 2025 – Present
Chicago, IL

- Design and train novel deep learning models for prostate MRI analysis, including accelerated MRI reconstruction, prostate zonal segmentation, lesion segmentation, and clinically significant prostate cancer (csPCa) detection.
- Working on a Hadamard-fused state-space architecture for a zonal-aware prostate cancer segmentation and detection achieving Dice scores of 85% on PZ and 95% on TZ for zonal segmentation on the PI-CAI benchmark, improving over prior baselines by 5 and 2 points respectively.
- Architect efficient CNN-, Transformer-, and Mamba-based models, applying transfer learning and foundation model fine-tuning to improve accuracy, robustness, and computational efficiency.
- Contribute to publications in leading medical imaging and AI research venues under Prof. Ulas Bagci and Prof. Ahmet Enis Cetin.

Research and Teaching Assistant, Electrical and Computer Engineering

University of Illinois Chicago Jan. 2023 – Present
Chicago, IL

- Develop and evaluate efficient deep learning and signal processing algorithms for computer vision, remote sensing, and real-time biomedical signal analysis.
- Build and benchmark AI models for wildfire and peatland fire detection across visible, infrared, and multispectral imagery; constructed a large-scale multimodal dataset spanning 7 classes with over 30,000 images in two classes alone, and improved peatland fire detection efficiency by at least 20% over prior methods.
- Deliver instruction for undergraduate and graduate courses in Digital Signal Processing and Neural Networks through office hours, lab sessions, and assignment development.

Assistant Editor

Springer Nature July 2025 – Present
Chicago, IL

- Review machine learning and signal processing manuscripts alongside Editor-in-Chief Prof. Ahmet Enis Cetin, evaluating technical quality, novelty, and clarity.

AI Trainer, Generative AI Model Evaluation

Handshake AI Jan. 2026 – May 2026
Chicago, IL

- Evaluated large-scale generative AI model outputs across multimodal tasks, improving response quality and factual accuracy.

Electrical Engineer

L3DFX LLC May 2022 – Jan. 2023
Bolingbrook, IL

- Designed and tested signal processing circuits and embedded systems for real-world applications.
- Integrated microcontroller-based solutions for control systems, improving system reliability and performance.

SKILLS

- **AI/ML:** Deep Learning, Computer Vision, Generative Models, Vision Transformers, State-Space Models (Mamba), Representation Learning, LLMs/VLMs
- **Frameworks & Programming:** PyTorch, TensorFlow, Python, C, MATLAB
- **Efficient AI:** Hardware-Aware ML, Low-Complexity Model Design, Transform-Based Learning (Hadamard, DCT), GPU Training (CUDA), FPGA Deployment
- **Tools:** Linux, Git, VS Code

AWARDS AND LEADERSHIP

- IEEE Communication Society, Secretary, UIC Student Branch Chapter (May 2025 – Present): Organize technical events and workshops focused on AI, signal processing, and communications systems.
- NASA Beyond the Algorithm Challenge, Top 9 Finalist (Sep. 2025): Developed transform-based ML layers (Hadamard, Haar wavelets) for efficient computing in quantum and in-memory systems (Team NVSense).
- NASA MSI Incubator Wildfire Climate Tech Challenge, Runner-Up (Mar. 2024): Built a computer vision system for wildfire situational awareness and early detection (Team FIRESENSE).
- NSF I-Corps (POSE Program), Entrepreneurial Lead (Feb. 2024): Led commercialization efforts for hardware-aware ML solutions (Team HLS4ML).

SELECTED PUBLICATIONS

- **Hamdan et al.**, “Toward Generalizable Deep Learning-Based Peatland Fire Detection via Walsh–Hadamard Transform and Domain Adaptation.” Developed an efficient Walsh–Hadamard transform-based framework with domain adaptation to improve the generalizability of deep learning-based peatland fire detection. *Under revision at Signal, Image and Video Processing (SVIP)*, 2026.
- **Hamdan et al.**, “Hybrid Multi-Dimensional MRI Prostate Cancer Detection via Hadamard-Based Bias Correction and Residual Networks.” Designed a hybrid transform-based pipeline for MRI bias correction and classification, improving cancer detection accuracy by 30%. *Published in IEEE Engineering in Medicine and Biology Society (EMBC)*, 2026.
- **Hamdan et al.**, “Large-Scale Open-Source Image and Video Dataset for Robust Wildfire Detection and Classification.” Introduced a large-scale multimodal wildfire benchmark spanning 7 classes with over 30,000 images per major class, and proposed an efficient Hadamard transform-based feature fusion mechanism for robust wildfire detection. *Accepted to IEEE International Conference on Image Processing (ICIP) HydroImaging Workshop*, 2026.
- Pan, **Hamdan et al.**, “Discrete Cosine Transform-Based Decorrelated Attention for Vision Transformers.” Developed two DCT-based methods to improve the efficiency and performance of Vision Transformers. *Accepted to International Joint Conference on Artificial Intelligence (IJCAI)*, 2026.
- **Hamdan et al.**, “Real-Time Instantaneous Phase Estimation Using a Deep Dual-Branch Complex Neural Network.” Proposed a lightweight neural architecture for real-time instantaneous phase estimation of neural oscillations, with FPGA implementation for low-latency deployment. *Published in IEEE Transactions on Biomedical Engineering (TBME)*, 2025.
- Ren, Sun, De Silva, Pan, Nie, **Hamdan et al.**, “Reconfigurable Electromagnetically Unclonable Functions Based on Graphene RF Modulators.” Developed and evaluated diffusion-based adversarial attacks using Denoising Diffusion Probabilistic Models (DDPMs) to assess the security and robustness of electromagnetic PUFs. *Published in ACS Nano*, 2025.
- **Hamdan et al.**, “Realistic Aircraft Crash Survivor Path Estimation via A-Star Search Algorithm and Gradient Descent.” Developed a framework for analyzing aircraft crash survivor movement using circuit theory to model connectivity across heterogeneous landscapes. *Published in European Signal Processing Conference (EUSIPCO)*, 2025.
- Hong, **Hamdan et al.**, “Wildfire Detection via Transfer Learning: A Survey.” Surveyed transfer learning approaches for large-scale wildfire detection, highlighting challenges in generalization and dataset bias. *Published in Signal, Image and Video Processing (SVIP)*, 2024.

PROFILES

- Google Scholar: <https://scholar.google.com/citations?hl=en&user=HeFM-v0AAAAJ>
- GitHub: github.com/Emadeldeen-Hamdan