

Kareem Metwaly

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PROFESSIONAL SUMMARY

Staff Machine Learning Engineer with a Ph.D. in Electrical Engineering and 8+ years of experience building and deploying deep learning systems for computer vision, image processing, and signal estimation. Author of publications at CVPR and ICASSP, holder of three patents, and experienced across the ML lifecycle from research and dataset construction to model optimization and on-device inference. Proven ability to drive technical work from first principles to production at Samsung Semiconductors, Scale AI, and Toyota Motor North America.

EXPERIENCE

Staff Machine Learning Engineer | Samsung Semiconductors | San Diego, CA, USA

January 2023 – Present

- Design, develop, and train deep learning models for computer vision deployed on smartphone hardware.
- Optimize models for real-time on-device inference, including quantization and efficiency improvements.
- Lead ML dataset collection, curation, and labeling pipelines, and drive generative AI initiatives.

Machine Learning Research Engineer Intern | Scale AI | San Francisco, CA, USA

June 2021 – December 2021

- Developed an attribute prediction ML model alongside a large-scale dataset labeling pipeline.
- Co-authored a paper accepted at CVPR 2022 and a dataset paper published on arXiv based on this work.

Machine Learning Intern | Toyota Motor North America | Mountain View, CA, USA

February 2021 – April 2021

- Developed an unsupervised GAN-based monocular depth estimation model for night-vision applications.
- Contributed to two issued U.S. patents covering style-transfer training and depth estimation via style transfer.

Software Engineer | Brightskies Technologies | Alexandria, Egypt

January 2017 – July 2018

- Developed and optimized C/C++ algorithms on parallel CPU architectures for seismic imaging.
- Presented four posters at international HPC conferences, including ISC High Performance and Intel HPC Developer Conference.

EDUCATION

Pennsylvania State University | Ph.D. in Electrical Engineering

Thesis: Explainable, Informed Deep Learning for Signal and Image Estimation. GPA: 3.96. | December 2022

Alexandria University | M.Sc. in Engineering Mathematics

Thesis: Optimized Cooperative LTE/Wi-Fi Transmission over Unlicensed Bands. GPA: 3.82. | June 2018

Alexandria University | B.Sc. in Electrical Engineering

Distinction with Degree of Honor, 88.72% (GPA $\approx$ 3.94). | June 2013

RESEARCH & TEACHING EXPERIENCE

- Research Assistant, Pennsylvania State University (iPAL Lab), PA, USA (August 2018 – August 2022): Developed deep learning algorithms for computer vision and inverse problems, resulting in an ICASSP HDR image generation publication; a CVPR publication and Second Place NTIRE 2020 result for non-homogeneous image dehazing; a PPG-funded defect detection system protected by a published patent; and ICASSP/IEEE TAES publications on algorithm unrolling for radar beampattern design.
- Teaching Assistant, Pennsylvania State University, PA, USA (August 2022 – December 2022): Taught and graded Linear Control Systems in the Electrical Engineering Department.
- Research Assistant, Collaborative Radio Cloud (CRC), Alexandria University (May 2016 – August 2017): Participated in the DARPA SC2 Challenge and contributed to an LTE/Wi-Fi coexistence project published at IEEE WCNC.
- Mathematics Teaching Assistant, Alexandria University, Alexandria, Egypt (April 2016 – June 2018): Taught applied mathematics courses to engineering students.
- Research Assistant, E-JUST and Wasiela Collaboration, Egypt (April 2014 – October 2015): Developed novel network-coding relay approaches published at IEEE ISCC.

TECHNICAL SKILLS

- ML Frameworks & Tools: PyTorch, TensorFlow, ONNX, Quantization, Optuna, TensorBoard, MLFlow ($\approx$ 8 years)
- Computer Vision: Video Segmentation, Image Restoration, Classification, Object Detection, Generative AI
- Programming: Python, C, C++, MATLAB, Linux/Bash (10+ years)
- Systems & Infrastructure: Git, Docker, Kubernetes, OpenMP, MPI, Intel Parallel Studio, SQL, Jupyter, VSCode

SELECTED PUBLICATIONS & PATENTS

- "MIMO Radar Beampattern Design via Algorithm Unrolling," IEEE Transactions on Aerospace and Electronic Systems, 2024.
- "Interpretable, Unrolled Deep Radar Beampattern Design," IEEE ICASSP, 2023.
- "GlideNet: Global, Local and Intrinsic based Dense Embedding NETwork for Multi-category Attributes Prediction," IEEE/CVF CVPR, 2022.
- "NonLocal Channel Attention for NonHomogeneous Image Dehazing," IEEE/CVF CVPR Workshops, 2020; Honorable Mention and Runner-up in NTIRE 2020.
- "Attention-Mask Dense Merger (AttenDense) Deep HDR for Ghost Removal," IEEE ICASSP, 2020.
- Three patents: US 11,941,081 B2; US 11,935,254 B2; WO 2021/247961 A1.

DEVELOPED TOOLBOXES

- CAR-API: API for the CAR dataset with a PyTorch interface — github.com/kareem-metwaly/car-api
- GlideNet: Deep learning model for multi-category attributes prediction — github.com/kareem-metwaly/glidenet
- AtJwD: Deep learning model for image dehazing; second in NTIRE 2020 — github.com/kareem-metwaly/AtJwD

AWARDS & HONORS

- Honorable Mention Award, IEEE CVPR 2020 Workshop; Runner-up (Second Place), NTIRE 2020 Non-Homogeneous Dehazing Competition.
- Joint RA/TA Award, Electrical Engineering Department, Pennsylvania State University.
- Honored annually as a top student throughout B.Sc. degree.

ONLINE PROFILES

Portfolio: kareem-metwaly.github.io | Google Scholar: scholar.google.com/citations?user=TTAGSOUAAAAJ&hl=en | GitHub: github.com/kareem-metwaly

ACTIVITIES & LEADERSHIP

- MGSO, Penn State University — Web Manager and Treasurer.
- ISCP, State College, PA — Activities Coordinator.
- IEEE Alexandria Student Branch — Volunteer Instructor.
- Library of Alexandria, Egypt — Volunteer; winner of a UNESCO world cultural competition twice.