

Kareem Metwaly

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Education

- **Ph.D. in Electrical Engineering**, The Pennsylvania State University, USA. **August 2018 – December 2022**
GPA: 3.96, Thesis: Explainable, Informed Deep Learning for Signal and Image Estimation.
- **M.Sc. in Engineering Mathematics**, Alexandria University, Egypt. **September 2014 – June 2018**
GPA: 3.82, Thesis: Optimized Cooperative LTE/Wi-Fi Transmission over Unlicensed Bands.
- **B.Sc. in Electrical Engineering**, Alexandria University, Egypt. **September 2008 – June 2013**
Grade: Distinction with Degree of Honor 88.72% (GPA \approx 3.94) – ranked 6th of 335 students.
Received a fund from the **Academy of Scientific Research and Technology (ASRT)** and **Vodafone**, Egypt

Industrial Experience

- **Senior Engineer at Samsung Semiconductors**, San Diego, CA, USA **January 2023 – Present**
Developing and optimizing new Deep Learning models for image and video restoration and analysis.
- **Machine Learning Research Engineer Intern at Scale AI**, San Francisco, CA, USA **June 2021 – December 2021**
Developing and implementing an attributes prediction Machine Learning model and dataset.
We published a CVPR 2022 paper and a dataset paper to be submitted to NeurIPS 2023 Dataset Track.
- **Ph.D. Intern at Toyota Motor North America, inc.**, Mountain View, CA, USA **February 2021 – April 2021**
Developing an unsupervised GAN-based model for monocular depth estimation for night vision. [filed 2 patents]
- **Software Engineer at Brightskies Technologies**, Alexandria, Egypt **January 2017 – July 2018**
Developing optimized algorithms on parallel architectures for Seismic Imaging [4 posters at multiple conferences].

Research/Teaching Experience

- **Teaching Assistant at the Pennsylvania State University**, PA, USA **August 2022 – December 2022**
Assisting in teaching and grading Linear Control Systems course in the Electrical Engineering Department.
- **Research Assistant at the Pennsylvania State University** (iPAL lab), PA, USA **August 2018 – August 2022**
Developing algorithms for Computer Vision and Inverse Problems in Image and Signal Processing: **1) AttenDense** for HDR image generation. **2) AtJwD** for dehazing [Second in a CVPR 2020 competition]. **3) Defect Detection and Classification** in marine vessels (funded by PPG industries) [filed a patent and a journal paper is under review].
- **Mathematics Teaching Assistant at Alexandria University**, Alexandria, Egypt **April 2016 – June 2018**
Teaching assistant duties for Applied Mathematics Courses for Engineering purposes.
- **Research Assistant at Collaborative Radio Cloud (CRC), Alexandria University.** **May 2016 – August 2017**
1) Participated in SC2 Challenge hosted by **DARPA**, USA. **2)** LTE/Wi-Fi Coexistence Project. [IEEE WCNC publication]
- **Research Assistant for a collaboration between E-JUST and Wasiela**, Egypt. **April 2014 – October 2015**
Developing new approaches for relaying using Network Coding. [IEEE ISCC publication]

Technical Skills

- **ML:** PyTorch, TensorFlow, Scikit-Learn, PyTorch-Lightning, Quantization, Optuna, TensorBoard, MLFlow. \approx 6 years
- **Programming Languages:** Python, C, C++, MATLAB, Bash, OOP concepts, Parallelism, Optimization > 10 years
- **Others:** Git, Docker, Jupyter, OpenMP, MPI, Intel Parallel Studio, Kubernetes, USRP kits, GNU Radio, Click, SQL

Some Developed Toolboxes

- **CAR-API:** API to access our developed 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 for image dehazing (**second** in NTIRE 2020 competition), github.com/kareem-metwaly/AtJwD
- **Defect Detection and Classification**: Deep Learning for defect detection/classification [Proprietary of PPG Industries]

Publications

- Kareem Metwaly, et al. "MIMO Radar Beampattern Design via Algorithm Unrolling," IEEE Transactions on Aerospace and Electronic Systems, vol. 60, no. 6, pp. 9204-9220, Dec. 2024.
- Kareem Metwaly, et al. "Interpretable, Unrolled Deep Radar Beampattern Design," 2023 the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023.
- Kareem Metwaly, Aerin Kim, Elliot Branson and Vishal Monga, "GlideNet: Global, Local and Intrinsic based Dense Embedding NETWORK for Multi-category Attributes Prediction," 2022 the IEEE/CVF Computer Vision and Pattern Recognition (CVPR), 2022.
- Kareem Metwaly, Aerin Kim, Elliot Branson and Vishal Monga, "CAR – Cityscapes Attributes Recognition A Multi-category Attributes Dataset for Autonomous Vehicles," to be submitted to NeurIPS 2023. arxiv: 2111.08243
- Li Yu*, Kareem Metwaly*, James Wang and Vishal Monga, "Surface Defect Detection and Evaluation for Marine Vessels using Multi-Stage Deep Learning," the IEEE transactions on Intelligent Transportation Systems (TITS). *Equal Contrib. [under review]
- Kareem Metwaly, et al., "NonLocal Channel Attention for NonHomogeneous Image Dehazing," the IEEE/CVF Computer Vision and Pattern Recognition (CVPR) workshops, 2020. "Honorable Mention Award" and "Runner-up" in NTIRE 2020 competition.
- Codruta O. Ancuti, Cosmin Ancuti, Florin-Alexandru Vasluiianu, Radu Timofte, Kareem Metwaly, et al. "NTIRE 2020 Challenge on NonHomogeneous Dehazing," The IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 2020.
- Kareem Metwaly and Vishal Monga, "Attention-Mask Dense Merger (AttenDense) Deep HDR for Ghost Removal," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Barcelona, Spain, 2020, pp. 2623-2627.
- Kareem M. Metwaly, Karim G. Seddik, Mustafa Y. ElNainay, "A Cooperative Scheme for the Coexistence of the LTE and WiFi Systems" in Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC), San Francisco, CA, 2017.
- Kareem Metwaly, Mahmoud Alaa Eldin, Maha Elsabrouty, "SISO and MIMO analog network coding relay architectures for the uplink of LTE-Advanced" in proceedings of the IEEE Symposium on Computer and Communication (ISCC), Larnaca, Cyprus, 2015.

Posters

- Kareem Metwaly, et al. from Brightskies Inc. and Philippe Thierry, Intel Corp, "Accelerated Reverse Time Migration with optimized IO" in HPC in Asia, ISC High Performance, Frankfurt, Germany, 2018.
- Essam Algizawy, Khaled Elamrawi, Kareem Morad, Ingy Monir, Mohamed ElBasyouni, Kareem Metwaly, Brightskies Inc. and Philippe Thierry, Intel Corp, "Highly Scalable Flexi-trace-based Pre-stack Time Migration" in HPC in Asia, ISC High Performance, Frankfurt, Germany, 2018.
- Kareem Metwaly, et al. from Brightskies Inc., Philippe Thierry, Intel Corp., "Revisited RTM IOs strategies with new memory hierarchies" in Intel eXtreme Performance User Group (IXPUG), KAUST, Thuwal, Kingdom of Saudi Arabia, 2018.
- Kareem Metwaly, Khaled Elamrawi, Essam Algizawy, Mohamed Mahmoud, Mohamed ElBasyouni, Brightskies Inc. and Philippe Thierry, Intel Corp, "Accelerated Reverse Time Migration with optimized IO" in Intel HPC Developer Conference, Denver, CO, 2017.

Honors and Awards

- "Honorable Mention Award" in the IEEE CVPR 2020 workshops and the **Second** in the NTIRE 2020 competition.
- Joint RA/TA award from the Electrical Engineering Department at the Pennsylvania State University, PA, USA.
- Honored yearly as a top student during my B.Sc. degree.

Talks and Conferences

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| - The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, LA, USA. | June 2022 |
| - The IEEE Conference on Computer Vision and Pattern Recognition (CVPR) workshops, Seattle, WA. | June 2020 |
| - The IEEE Conference on Acoustics, Speech, and Signal Processing (ICASSP), Barcelona, Spain. | May 2020 |
| - The IEEE Wireless Communications and Networking Conference (WCNC), San Francisco, CA, USA. | March 2017 |
| - The IEEE Symposium on Computers and Communications (ISCC), Larnaca, Cyprus. | July 2015 |

Voluntary Activities

- The current **Web Manager** and former **Treasurer** of MGSO [a student organization at Penn State].
- The current **Activities Coordinator** of ISCP [a non-profit organization at Center County, PA, USA].
- Former volunteering teacher for freshmen students for Embedded Systems [IEEE Alexandria Student Branch].
- Participated in Minesweepers competition [German University in Cairo] as well as a SIEMENS-funded project.
- Former volunteer in the **Library of Alexandria**, Egypt – 2 times winning of a world cultural competition [UNESCO].
- A former volunteer at Sona' Elhaya, Egypt – a charitable and non-profit organization.

Languages

Arabic: Native

English: Fluent

German: Basic

Italian: Basic