

# 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: Prior Guided Deep Learning for Image Restoration and Analysis. (Expected)
- **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 6<sup>th</sup> of 335 students.  
Received a fund from the **Academy of Scientific Research and Technology (ASRT)** and **Vodafone**, Egypt

## Industrial Experience

- **ML Ph.D. 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**, 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

- **Research Assistant at the Pennsylvania State University** (iPAL lab), PA, USA **August 2018 – Present**  
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, Optuna, TensorBoard, MLFlow.  $\approx$  4 years
- **Programming Languages**: Python, C, C++, MATLAB, Bash, OOP concepts, Parallelism, Optimization > 8 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](https://github.com/kareem-metwaly/car-api)
- **GlideNet**: Deep Learning model for multi-category attributes prediction, [github.com/kareem-metwaly/glidenet](https://github.com/kareem-metwaly/glidenet)
- **AtJwD**: Deep Learning for image dehazing (second in NTIRE 2020 competition), [github.com/kareem-metwaly/AtJwD](https://github.com/kareem-metwaly/AtJwD)
- **Defect Detection and Classification**: Deep Learning for defect detection/classification [Proprietary of PPG Industries]

## Publications

- **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 Vasluianu, 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

- 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**

## Professional Activities / Affiliations

- Member of the Institute of Electrical and Electronics Engineering (IEEE).
- Reviewer of several journals and conferences such as: IEEE TPAMI, IEEE TITS, IEEE ICIP and IEEE ICASSP.

## 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 MinesSweepers 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

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|-------------------------|--------------------------|
| - <b>Arabic:</b> Native | - <b>English:</b> Fluent |
| - <b>German:</b> Basic  | - <b>Italian:</b> Basic  |