Ewa Magdalena Nowara, Ph.D.

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SUMMARY

Ph.D. researcher with 6+ years of industry and academic research experience leading research and product development in Computer Vision, Deep Learning, and camera-based physiology. Currently utilizing methods for classification and scene understanding with applications for geo-localization from a single RGB image. Published in over 10 top tier venues, and owner of 2 patents. Passionate about having an impact on products to improve people's quality and enjoyment of life.

EDUCATION

- **Ph.D.** in Electrical and Computer Engineering, Rice University, Houston, TX **August 2015 - May 2021**
- **M.S.** in Electrical and Computer Engineering, Rice University, Houston, TX **August 2015 - May 2018**
- **B. S.** in Physics, St. Mary's University, San Antonio, TX **August 2011 - May 2015**

RELEVANT SKILLS

Deep Learning: Vision Transformers, ResNet, Metric Learning, U-Net, LSTM, Convolutional Attention Networks, CNN
Programming: Python, MATLAB, LATEX, Docker, Shell, HTML/CSS, (Some: C++, C)
Tools: PyTorch, TensorFlow, Keras, NumPy, SciPy, sklearn, Pandas, Matplotlib, OpenCV, Illustrator, 3D Printing, Soldering, Optics, Linux, Windows, Arduino
Math: Machine Learning, Deep Learning, Computer Vision, Signal Processing, Optimization, Image Processing

RESEARCH EXPERIENCE

Johns Hopkins University, Baltimore, MD **May 2021 - Present**
Postdoctoral Research Fellow in Electrical and Computer Engineering, Advisor: Prof. Rama Chellappa

- Build computer vision and machine learning algorithms for geo-localization from a single RGB image in a classification setting, including Vision Transformer, ResNet, and Triplet Network architectures
- Design multi-modal models leveraging both RGB images and corresponding semantic segmentation maps to improve the model's invariance to appearance changes

Rice University, Houston, TX **May 2015 – May 2021**
Ph.D. Researcher in Electrical and Computer Engineering, Advisor: Ashok Veeraraghavaan

- Developed hardware and algorithmic solutions to enable robust vital signs monitoring with cameras in the wild
- Trained supervised deep learning models to overcome video compression artifacts for a telemedicine application
- Designed novel data augmentation to reduce overfitting of deep learning models trained on small physiology datasets

PROFESSIONAL EXPERIENCE

Los Alamos National Laboratory, Los Alamos, NM **October 2020 - February 2021**
Research Intern (Theoretical Division, T-5), Mentor: Brendt Wohlberg

- Developed Encoder-Decoder and Long-Short-Term Memory (LSTM) architectures to reconstruct high resolution images obtained from multiple ptychographic measurements without access to ground truth

Microsoft Research, Redmond, WA **June 2019 - June 2020**
Research Intern (Human Understanding and Empathy Team), Mentors: Daniel McDuff, Mary Czerwinski

- Built a novel Convolutional Attention Neural Network to denoise temporal intensity signals from video
- Created realistic 3D avatars using computer graphics and physiological signals obtained from video

Mitsubishi Electric Research Laboratories, Cambridge, MA **May 2017 - June 2019**
Research Intern (Computer Vision Team), Mentors: Tim Marks, Hassan Mansour

- Collaboratively built hardware for a driver monitoring system by using RGB and NIR cameras, light sources synchronized with camera frame capture, optical and 3D printed components
- Developed optimization and signal processing algorithms using Robust Principal Components Analysis (RPCA), Alternating Direction Method of Multipliers (ADMM), face detection, face alignment, and tracking
- Collected and released the first large public driving dataset with face videos and physiological signals

SELECTED RECENT PUBLICATIONS (Full list on Google Scholar)

1. **Nowara, E. M.**, McDuff, D., Veeraraghavan, A. "The Benefit of 'Distraction': Denoising Video-Based Physiological Measurements using Inverse Attention" *ICCV,* 2021
2. **Nowara, E. M.**, McDuff, D., Veeraraghavan, A. "Combining Magnification and Measurement for Non-Contact Cardiac Monitoring" *CVPR Workshops*, 2021
3. **Nowara, E. M.**, McDuff, D., "'Warm Bodies': A Post-Processing Technique for Animating Dynamic Blood Flow on Photos and Avatars" *ACM CHI Conference on Human Factors in Computing Systems,* 2021
4. **Nowara, E. M.**, McDuff, D., Veeraraghavan, A. "A Systematic Analysis of Video-based Pulse Measurement from Compressed Videos" *Biomedical Optics Express,* 12.1 494-508, 2021
5. **Nowara, E. M.**, Marks, T. K., Mansour, H., Veeraraghavan, A. "Near-Infrared Imaging Photoplethysmography During Driving" *IEEE Tr1ansactions on Intelligent Transportation Systems,* 2020
6. **Nowara, E. M.**, McDuff, D., Veeraraghavan, A. "A Meta-Analysis of the Impact of Skin Type and Gender on Non-contact Photoplethysmography Measurements" *CVPR Workshops*, 2020
7. **Nowara, E. M.**, Sabharwal, A., Veeraraghavan, A. "PPGSecure: Biometrics Presentation Attack Detection Using Photoplethysmograms." *Automatic Face and Gesture Recognition (FG),* 2017

PATENTS

1. Marks T., Mansour H., **Nowara E.**, Nakamura Y., Veeraraghavan A., inventors; Mitsubishi Electric Corp, Mitsubishi Electric Research Laboratories Inc, assignee. "System and Method for Remote Measurements of Vital Signs of a Person in a Volatile Environment." *US Patent App. 17/199,696*, 2021
2. Marks T., Mansour H., **Nowara E.**, Nakamura Y., Veeraraghavan A., inventors; Mitsubishi Electric Corp, Mitsubishi Electric Research Laboratories Inc, assignee. "System and method for remote measurements of vital signs." *United States patent application 16/167,668*, 2019

SELECTED AWARDS AND HONORS

- Invited speaker, Microsoft Research AI Breakthroughs **2020**
- Best graduate poster and demo, ECE Corporate Affiliates Day at Rice University **2019**
- Ken Kennedy Institute for Information Technology Schlumberger Fellowship **2017 - 2018**
- Selected attendee, Doctoral Consortium at Automatic Face and Gesture Recognition **2017**
- Selected attendee, CRA-W (Computing Research Association) Grad Cohort **2016**

LEADERSHIP AND MENTORSHIP

Vital Sign AI (startup volunteer project) **April 2020 - December 2020**

Computer Vision and Machine Learning Research Lead, *Remote*

- Created a free app to measure vital signs remotely with cameras and microphones, and to detect abnormalities in vital signs caused by COVID-19

Reviewer **August 2019 - Present**

- Served as a reviewer for top tier computer vision, machine learning, and biomedical engineering conferences and journals, including CVPR, ICCV Workshops, AAAI, Automatic Face and Gesture Conference, Biomedical Optics Express, Journal of Biomedical and Health Informatics

Research Experience for Undergraduates (REU) **Summers of 2016, 2020**

Mentor, *Rice University, Houston, TX*

- Mentored undergraduate students in research projects in Computer Vision and Computational Photography