

Max Ehrlich, Ph.D.

Member of AAAI, IEEE, & CVF
<https://maxlikelihood.ai>
<https://scholar.google.com/citations?user=q-WSy3AAAAAJ>
English, 한국어

Statement of Research

“A First Principles Approach to Media and Deep Learning”

My current research combines machine learning and computational imaging to solve real problems. My focus is on breaking down and understanding the first principles of the problem and then building these principles back up into a machine learning solution rather than treating the model as a black box.

In the past I have successfully applied this idea to image enhancement. The broader impact of this is to improve participation from underrepresented groups. For example, by creating better multimedia compression algorithms which incorporate simple deep learning based techniques, people operating in underinvested locations (e.g., rural areas, Native American reservations, 3rd world countries) are able to participate in an increasingly media-focused internet. I am grateful to have had recognition of the importance of this work by many funding partners over the years including government agencies: DARPA and IARPA, and private companies: Facebook AI, Adobe DIL, and NVIDIA ADLR.

Education

Doctor of Philosophy in Computer Science Aug. 2017 – May 2022
University of Maryland, College Park
Advisors Larry Davis, Abhinav Shrivastava

Master of Science in Computer Science Feb. 2014 – Aug. 2015
Stevens Institute of Technology
Advisor Philippos Mordohai

Bachelor of Science in Computer Science Sep. 2007 – May 2011
Rutgers University, New Brunswick

Selected Awards

Larry S. Davis Doctoral Dissertation Award 2022
University of Maryland Department of Computer Science
Awarded to the top 2 dissertations of the prior academic year

Outstanding Research Assistant 2022
University of Maryland
Awarded to the top 2% of graduate assistants

Future Faculty Fellow 2021
University of Maryland Clark School of Engineering
Awarded to students who are likely to attain a tenure-track faculty position

Service

Conference Reviewer AAAI 2020, ICLR 2020, ECCV {2020-2022}, IJCAI 2021, CVPR {2021-2023}, ICML 2021, ICCV {2021-2023}, WACV 2022

Journal Reviewer Transactions on Image Processing, International Journal of Artificial Intelligence, The Visual Computer, Transactions on Circuits and Systems for Video Technology, IEEE Access, Digital Signal Processing

Experience & Appointments

Research Scientist Aug. 2022 – Present
NVIDIA
Research in Computer Vision, Machine Learning, and Computational Media.

Adjunct Assistant Professor May 2023 – Present
Computer Science Department and Institute for Advanced Computer Studies, University of Maryland (College Park)
Perception and Intelligence lab, general research and teaching in Artificial Intelligence, Machine Learning, and Computer Vision

Research Assistant Aug. 2017 – May 2022
University of Maryland Institute for Advanced Computer Studies
Developed an independent research program and successfully won funding through DARPA and IARPA (Core3D, GARD, SemaFor) programs and a three year grant from Facebook AI. Served on the Graduate Admissions Committee, CS Department Education Committee, and the CMNS Diversity and Inclusion Council.

Research Intern June 2021 – Nov. 2021
NVIDIA
Research in video restoration and enhancement.

Research Mentor June 2021 – Aug. 2021
Summer STEM Institute
Mentored two students to produce successful research papers. One paper was published in the Medical Computer Vision workshop at ECCV 2022.

Visiting Research Engineer July 2020 – Mar. 2021
Facebook AI
Research in compression robustness and its applications to adversarial defense.

Machine Learning Intern June 2019 – Aug. 2019
Adobe Research
Research in scanned document image restoration and denoising using deep CNN regression.

Computer Scientist July 2011 – July 2017
SRI International
Produced original research and publications in computer vision and machine learning. Designed and implemented algorithms to solve real-world computer vision problems.

Intern June 2008 – May 2011
Sarnoff Corporation
Assisted with research and data collection/analysis for image processing systems including object tracking and fingerprinting, stereo imaging, classification, and segmentation.

Intern May 2007 – June 2008
Rutgers University, WINLAB
Created graphical user interfaces to visualize network data. Learned advanced Linux usage. Maintained Linux servers.

Publications & Patents

- [1] **Max Ehrlich**, Jon Barker, Namitha Padmanabhan, Larry Davis, Andrew Tao, Bryan Catanzaro, and Abhinav Shrivastava. “Leveraging Bitstream Metadata for Fast, Accurate, Generalized Compressed Video Quality Enhancement”. In: *WACV*. 2024.
- [2] Shishira R Maiya, **Max Ehrlich**, Vatsal Agarwal, Ser-Nam Lim, Tom Goldstein, and Abhinav Shrivastava. “Unifying the Harmonic Analysis of Adversarial Attacks and Robustness”. In: *BMVC*. 2023.
- [3] Shishira R Maiya, Sharath Girish, **Max Ehrlich**, Hanyu Wang, Kwot Sin Lee, Patrick Poirson, Pengxiang Wu, Chen Wang, and Abhinav Shrivastava. “NIRVANA: Neural Implicit Representations of Videos with Adaptive Networks and Autoregressive Patch-wise Modeling”. In: *CVPR*. 2023.
- [4] **Max Ehrlich**. “The First Principles of Deep Learning and Compression”. In: *arXiv preprint arXiv:2204.01782* (2022). Doctoral Dissertation.
- [5] Evan Wen, Rebecca Sorenson, and **Max Ehrlich**. “ReLaX: Retinal Layer Attribution for Guided Explanations of Automated Optical Coherence Tomography Classification”. In: *ECCV Workshops*. 2022.
- [6] **Max Ehrlich**, Larry Davis, Ser-Nam Lim, and Abhinav Shrivastava. “Analysing and Mitigating JPEG Compression Defects in Deep Learning”. In: *ICCV Workshops*. 2021.
- [7] **Max Ehrlich**, Larry Davis, Ser-Nam Lim, and Abhinav Shrivastava. “Quantization Guided JPEG Artifact Correction”. In: *ECCV*. 2020.
- [8] Mohamed R Amer, Timothy J Shields, Amir Tamrakar, **Max Ehrlich**, and Timur Almaev. *Deep multi-task representation learning*. US Patent App. 16/085,859. Jan. 2019.
- [9] **Max Ehrlich** and Larry S Davis. “Deep Residual Learning in the JPEG Transform Domain”. In: *ICCV*. 2019.
- [10] Arthita Ghosh, **Max Ehrlich**, Larry Davis, and Rama Chellappa. “Unsupervised Super-Resolution of Satellite Imagery for High Fidelity Material Label Transfer”. In: *IGARS*. 2019.
- [11] Arthita Ghosh, **Max Ehrlich**, Sohil Shah, Larry S Davis, and Rama Chellappa. “Stacked u-nets for ground material segmentation in remote sensing imagery”. In: *CVPR Workshops*. 2018.
- [12] Timothy J Shields, Mohamed R Amer, **Max Ehrlich**, and Amir Tamrakar. “Action-affect-gender classification using multi-task representation learning”. In: *CVPR Workshops*. 2017.
- [13] **Max Ehrlich** and Philippos Mordohai. “Discriminative hand localization in depth images”. In: *3DUI*. 2016.
- [14] **Max Ehrlich**, Timothy J Shields, Timur Almaev, and Mohamed R Amer. “Facial attributes classification using multi-task representation learning”. In: *CVPR Workshops*. 2016.
- [15] **Max Ehrlich**. “Discriminative Hand Tracking from Depth Images”. In: *Master’s Thesis, Stevens Institute of Technology* (2015).