

CAGATAY ISIL

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SUMMARY

Computational imaging expert with a strong technical background, industrial experience, and team-oriented skills, seeking opportunities to leverage expertise in **computational imaging, machine learning, and computer vision**.

EDUCATION

University of California, Los Angeles, USA

Ph.D. in Electrical and Computer Engineering

2019 – 2025

Dissertation: [Deep learning-enabled computational imaging: from diffractive computing to microscopy](#)

Middle East Technical University, Ankara, Turkey

M.S. in Electrical and Electronics Engineering

2017 – 2019

B.S. in Physics (**Double Major**)

2015 – 2018

B.S. in Electrical and Electronics Engineering

2013 – 2017

SKILLS

Programming

Python, MATLAB, R, C/C++

Libraries/Frameworks

Jax, Pytorch, Tensorflow, Keras, Numpy, Pandas

Development tools

CAD (Inventor, Solidworks), LabVIEW, Zemax

EXPERIENCE

Postdoctoral Scholar

Jul 2025 – Present

Computational 3D Microscopy Laboratory, Stanford University

Stanford, CA

- ML for 3D microscopy/pathology

Research Intern

Apr 2025 – Jul 2025

Scale AI

San Francisco, CA

- Contributed to the data curation of challenging, domain-specific problems to evaluate and benchmark the performance of frontier generative AI models

Graduate Researcher

Sep 2019 – Mar 2025

Computational Imaging Laboratory, UCLA

Los Angeles, CA

- Developed a virtual staining technique for bacteria using a **generative adversarial network (GAN)**, transforming **darkfield microscopy** images into Gram-stained equivalents without chemical staining. Implemented a **segmentation algorithm** to quantify the technique's accuracy using various metrics including precision (95.5%), recall (96.5%), and F1-score (96%).
- Implemented **image registration** pipelines incorporating both rigid and non-rigid transformations, image stitching, and data cleaning for multiple microscopy projects, enabling precise pixel-to-pixel alignment of input and target images from various imaging modalities.
- Built a novel **analog image denoiser** for non-iterative noise removal at the speed of light, overcoming latency and computational burdens of traditional digital methods. Designed this all-optical denoiser using **deep learning** to scatter noise-related features while preserving desired object features and achieving 30–40% power efficiency. **Experimentally validated** the concept using a fabricated processor at the terahertz spectrum.
- Developed a **deep learning-enabled coherent display system** overcoming space-bandwidth product (SBP) limitations of traditional wavefront modulators. Designed a pair of **CNN-based image encoder** and **all-optical decoder** to project super-resolved images using low-resolution modulators, increasing the SBP by \sim 16-fold. **Experimentally demonstrated** this framework at the terahertz spectrum.

- Implemented an automated system for phenotypic analysis of microalgae populations using an imaging flow cytometer, **deep neural networks**, and **image processing**. Performed **algae identification** using **convolutional neural networks**, enabling rapid assessment of environmental factors and inter-specific interactions on algal growth and ecosystem health.
- Implemented a **Denoising Diffusion Implicit Model (DDIM)** to address the pixel super-resolution problem, achieving approximately 4x super-resolution on images.

Research Engineer

ASELSAN Research Center

2017 – 2019

Ankara, Turkey

- Developed an iterative algorithm combining multiple **U-nets** with the hybrid input-output (HIO) method for the phase retrieval problem, a classical **inverse problem in imaging**. Demonstrated its robustness under various initialization conditions and noise levels.
- Implemented a **coupled deep autoencoder** to enhance resolution in **wide-field interferometric microscopy**. Demonstrated the network's ability to reconstruct **denoised and resolution-enhanced** image patches for previously unseen inputs, potentially increasing the detection and classification accuracy of subdiffraction-limited nanoparticles.
- Combined a **variational autoencoder** model with triplet loss to improve clustering performance in the latent space for **representation learning**.

JOURNAL PUBLICATIONS

-
- Ç. Işıl and F. S. Oktem, '[Deep plug-and-play HIO approach for phase retrieval](#),' Applied Optics, 2025
 - Ç. Işıl, H. C. Koydemir, M. Eryilmaz, K. de Haan, N. Pillar, K. Montesoglu, A. F. Unal, Y. Rivenson, S. Chandrasekaran, O. B. Garner, and A. Ozcan, '[Virtual Gram staining of label-free bacteria using darkfield microscopy and deep learning](#),' Science Advances, 2025
 - G. Ma, C. Shen, J. Li, L. Huang, Ç. Işıl, F. O. Ardic, X. Yang, Y. Li, Y. Wang, M. S. S. Rahman, and A. Ozcan, '[Unidirectional imaging with partially coherent light](#),' Advanced Photonics Nexus, 2024
 - G. Ma, X. Yang, B. Bai, J. Li, Y. Li, T. Gan, C. Shen, Y. Zhang, Y. Li, Ç. Işıl, M. Jarrahi, and A. Ozcan, '[Multiplexed All-Optical Permutation Operations Using a Reconfigurable Diffractive Optical Network](#),' Laser & Photonics Reviews, 2024
 - M. J. Fanous, P. C. Costa, Ç. Işıl, L. Huang and A. Ozcan, '[Neural Network-Based Processing and Reconstruction of Compromised Biophotonic Image Data](#),' Light:science & applications, 2024
 - J. Hu, K. Liao, N. U. Dinc, C. Gigli, B. Bai, T. Gan, X. Li, H. Chen, X. Yang, Y. Li, Ç. Işıl, M. S. S. Rahman, J. Li, X. Hu, M. Jarrahi, D. Psaltis, and A. Ozcan, '[Subwavelength imaging using a Solid-Immersion Diffractive Optical Processor](#),' eLight, 2024
 - Ç. Işıl, T. Gan, F. O. Ardic, K. Montesoglu, J. Digani, H. Karaca, H. Chen, J. Li, D. Mengü, M. Jarrahi, K. Akşit, and A. Ozcan, '[All-optical image denoising using a diffractive visual processor](#),' Light:science & applications, 2024
 - M. S. S. Rahman, T. Gan, E. A. Deger, Ç. Işıl, M. Jarrahi, and A. Ozcan, '[Learning Diffractive Optical Communication Around Arbitrary Opaque Occlusions](#),' Nature Communications, 2023
 - Y. Li, T. Gan, B. Bai, Ç. Işıl, M. Jarrahi, and A. Ozcan, '[Optical information transfer through random unknown diffusers using electronic encoding and diffractive decoding](#),' Advanced Photonics, 2023
 - Ç. Işıl, D. Mengü, Y. Zhao, A. Tabassum, J. Li, Y. Luo, M. Jarrahi, and A. Ozcan, '[Super-resolution image display using diffractive decoders](#),' Science Advances, 2022
 - Ç. Işıl, K. de Haan, Z. Göröcs, H. Ceylan Koydemir, S. Peterman, D. Baum, F. Song, T. Skandakumar, E. Gumustekin, and A. Ozcan, '[Phenotypic Analysis of Microalgae Populations Using Label-Free Imaging Flow Cytometry and Deep Learning](#),' ACS Photonics, 2021.
 - Ç. Işıl, F. S. Oktem, and A. Koç, '[Deep Iterative Reconstruction for Phase Retrieval](#),' Applied Optics, 2019

- **Ç. Işıl**, M. Yorulmaz, B. Solmaz, A. B. Turhan, C. Yurdakul, S. Ünlü, E. Ozbay, and A. Koç, ‘**Resolution enhancement of wide-field interferometric microscopy by coupled deep autoencoders,**’ Applied Optics, 2018

CONFERENCE PUBLICATIONS

- **Ç. Işıl**, H. Chen, T. Gan, F. O. Ardic, K. Montesoglu, J. Digani, H. Karaca, J. Li, D. Mengü, M. Jarrahi, K. Akşit, and A. Ozcan, ‘**Diffractive processors enable all-optical image denoising,**’ SPIE AI and Optical Data Sciences VI, 2025
- J. Hu, K. Liao, N. U. Dinc, C. Gigli, B. Bai, T. Gan, X. Li, H. Chen, X. Yang, Y. Li, **Ç. Işıl**, M. S. S. Rahman, J. Li, X. Hu, M. Jarrahi, D. Psaltis, and A. Ozcan, ‘**All-optical subwavelength imaging using a solid immersion diffractive processor,**’ SPIE AI and Optical Data Sciences VI, 2025
- Y. Li, T. Gan, B. Bai, **Ç. Işıl**, M. Jarrahi, and A. Ozcan, ‘**Optical information transfer through random unknown diffusers using a diffractive decoder with electronic encoding,**’ Frontiers in Optics + Laser Science, 2024
- **Ç. Işıl**, D. Mengü, Y. Zhao, A. Tabassum, J. Li, Y. Luo, M. Jarrahi, and A. Ozcan, ‘**Diffractive super-resolution image display,**’ SPIE: Emerging Topics in Artificial Intelligence, 2024
- J. Hu, K. Liao, N. U. Dinc, C. Gigli, B. Bai, T. Gan, X. Li, H. Chen, X. Yang, Y. Li, **Ç. Işıl**, M. S. S. Rahman, J. Li, X. Hu, M. Jarrahi, D. Psaltis, and A. Ozcan, ‘**Solid-immersion diffractive imaging,**’ SPIE: Emerging Topics in Artificial Intelligence, 2024
- **Ç. Işıl**, T. Gan, F. O. Ardic, K. Montesoglu, J. Digani, H. Karaca, H. Chen, J. Li, D. Mengü, M. Jarrahi, K. Akşit, and A. Ozcan, ‘**Diffractive processors enable all-optical image denoising,**’ SPIE: Emerging Topics in Artificial Intelligence, 2024
- **Ç. Işıl**, T. Gan, F. O. Ardic, K. Montesoglu, J. Digani, H. Karaca, H. Chen, J. Li, D. Mengü, M. Jarrahi, K. Akşit, and A. Ozcan, ‘**Image denoising using diffractive optical processors,**’ CLEO: Fundamental Science, 2024
- Y. Li, T. Gan, B. Bai, **Ç. Işıl**, M. Jarrahi, and A. Ozcan, ‘**Transferring optical information through random unknown diffusers using a diffractive decoder with electronic encoding,**’ SPIE AI and Optical Data Sciences, 2024
- M. S. S. Rahman, T. Gan, E. A. Deger, **Ç. Işıl**, M. Jarrahi, and A. Ozcan, ‘**Information transfer around arbitrary opaque occlusions using programmed diffraction,**’ SPIE AI and Optical Data Sciences, 2024
- M. S. S. Rahman, T. Gan, E. A. Deger, **Ç. Işıl**, M. Jarrahi, and A. Ozcan, ‘**Optical Communication Around Opaque Occlusions Using Electronic Encoding and Diffractive Decoding,**’ OSA Frontiers in Optics + Laser Science, 2023
- **Ç. Işıl***, D. Mengü, Y. Zhao, A. Tabassum, J. Li, Y. Luo, M. Jarrahi, and A. Ozcan, ‘**Diffractive decoders project super-resolved images,**’ SPIE: AI and Optical Data Sciences, 2023
- **Ç. Işıl***, D. Mengü, Y. Zhao, A. Tabassum, J. Li, Y. Luo, M. Jarrahi, and A. Ozcan, ‘**Super-resolution image projection using a diffractive optical decoder,**’ CLEO: Fundamental Science, 2023
- **Ç. Işıl***, K. de Haan, Z. Göröcs, H. Ceylan Koydemir, S. Peterman, D. Baum, F. Song, T. Skandakumar, E. Gumustekin, and A. Ozcan, ‘**Label-free imaging flow cytometry for phenotypic analysis of microalgae populations using deep learning,**’ OSA Frontiers in Optics + Laser Science, 2021
- **Ç. Işıl***, K. De Haan, H. Ceylan Koydemir, Z. Göröcs, D. Baum, F. Song, T. Skandakumar, E. Gumustekin, and A. Ozcan, ‘**Label-free analysis of micro-algae populations using a high-throughput holographic imaging flow cytometer and deep learning,**’ SPIE Label-free Biomedical Imaging and Sensing, 2021,
- **Ç. Işıl*** and F. S. Oktem, ‘**Model-based Phase Retrieval with Deep Denoiser Prior,**’ OSA Imaging and Applied Optics Congress, 2020
- **Ç. Işıl***, F. S. Oktem, and A. Koç, ‘**Deep Learning-Based Hybrid Approach for Phase Retrieval,**’ OSA Imaging and Applied Optics Congress, 2019
- **Ç. Işıl** and F. S. Oktem*, ‘**A phase-space approach to diffraction-limited resolution,**’ OSA Adaptive Optics: Analysis, Methods ,& Systems, 2018

- **Ç. Işıl***, B. Solmaz, and A. Koç, ‘**Variational autoencoders with triplet loss for representation learning,**’ IEEE Signal Processing and Communications Applications Conference, 2018
- M. Yorulmaz*, **Ç. Işıl**, E. Seymour, C. Yurdakul, B. Solmaz, A. Koc, and M. S. Ünlü, ‘**Single-particle imaging for biosensor applications,**’ SPIE Emerging Imaging and Sensing Technologies for Security and Defence II, 2017

*Speakers of the conferences

PATENTS

- A. Ozcan, **Ç. Işıl**, D. Mengu, and M. S. S. Rahman, ‘**Super-resolution image display and free space communication using diffractive decoders,**’ WO2023244949A1, 2023

PROFESSIONAL SERVICES

Reviewer

More than 10 articles

- Siggraph Asia (1 review), ACM Transactions on Graphics (TOG) (1 review), Optics Letters (3 reviews), Optics Express (6 reviews), Applied Optics (2 reviews), Journal of the Optical Society of America A (1 review)

Mentor

Bio- and Nano- Photonics Laboratory, UCLA

Sep 2019 – Mar 2025

Los Angeles, CA

- mentored and supervised more than 5 undergraduate researchers

ACHIEVEMENTS, CERTIFICATES & HONORS

- Certificate for the paper entitled “**All-optical image denoising using a diffractive visual processor**” as one of the top downloaded papers of Light: Science & Applications in 2024.
- TUBITAK (The Scientific and Technological Research Council of Turkey) Scholarship for the M.S. degree
- TUBITAK Scholarship for the double major
- Dean’s High Honor List, Middle East Technical University (All semesters, except for one)
- LabVIEW Certified Associate Developer (2017-2019)
- Honor Certificate in High School
- Ranked 2115th in the national university entrance examination among two million students, 2012
- Information & Communication Technologies Certificate by Ericsson