

**Diffractive Optical Networks &  
Computational Imaging Without a Computer**

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**Abstract**

We will discuss diffractive optical networks designed by deep learning to all-optically implement various complex functions as the input light diffracts through spatially-engineered surfaces. These diffractive processors complete their computational task at the speed of light propagation through thin, passive optical layers and have various applications, e.g., all-optical image analysis, feature detection, object classification, computational imaging and seeing through diffusers. They also enable task-specific camera designs and new optical components for, e.g., spatial, spectral and temporal beam shaping, polarization engineering and spatially-controlled wavelength division multiplexing. These deep learning-designed diffractive networks broadly impact (1) all-optical statistical inference engines, (2) computational cameras and microscopes, and (3) inverse design of optical systems that are task-specific.

## **Bio**

Dr. Aydogan Ozcan is the Chancellor's Professor and the Volgenau Chair for Engineering Innovation at UCLA and an HHMI Professor with the Howard Hughes Medical Institute, leading the Bio- and Nano-Photonics Laboratory at UCLA School of Engineering and is also the Associate Director of the California NanoSystems Institute. Dr. Ozcan is elected Fellow of the National Academy of Inventors (NAI), holds >55 issued/granted patents, and is the author of one book and the co-author of >800 peer-reviewed publications in major scientific journals and conferences. Dr. Ozcan is the founder and a member of the Board of Directors of Lucendi Inc., Hana Diagnostics, Pictor Labs, as well as Holomic/Cellmic LLC, which was named a Technology Pioneer by The World Economic Forum in 2015. Dr. Ozcan is also a Fellow of the American Association for the Advancement of Science (AAAS), the International Photonics Society (SPIE), the Optical Society of America (OSA), the American Institute for Medical and Biological Engineering (AIMBE), the Institute of Electrical and Electronics Engineers (IEEE), the Royal Society of Chemistry (RSC), the American Physical Society (APS) and the Guggenheim Foundation, and has received major awards including the Presidential Early Career Award for Scientists and Engineers, International Commission for Optics (ICO) Prize, Joseph Fraunhofer Award & Robert M. Burley Prize (Optica), Biophotonics Technology Innovator Award (SPIE), Rahmi M. Koc Science Medal, International Photonics Society Early Career Achievement Award (SPIE), Army Young Investigator Award, NSF CAREER Award, NIH Director's New Innovator Award, Navy Young Investigator Award, IEEE Photonics Society Young Investigator Award and Distinguished Lecturer Award, National Geographic Emerging Explorer Award, National Academy of Engineering The Grainger Foundation Frontiers of Engineering Award and MIT's TR35 Award for his seminal contributions to computational imaging, sensing and diagnostics. Dr. Ozcan is also listed as a Highly Cited Researcher by Web of Science, Clarivate.