2022

Artificial Intelligence and Machine Learning in Optical Information Processing: Introduction to the Feature Issue

Khan Iftekharuddin
Old Dominion University, kiftekha@odu.edu

Chrysanthe Preza

Abdul Ahad S. Awwal

Michael E. Zelinski

Original Publication Citation

Iftekharuddin, K., Preza, C., Awwal, A. A. S., & Zelinski, M. E. (2022). Artificial intelligence and machine learning in optical information processing: Introduction to the feature issue. *Applied Optics, 61*(7), AIML1. https://doi.org/10.1364/ao.456405

applied optics

Artificial Intelligence and Machine Learning in Optical Information Processing: introduction to the feature issue

KHAN IFTEKHARUDDIN,[1] CHRYSANTHE PREZA,[2] ABDUL AHAD S. AWWAL,[3] AND MICHAEL E. ZELINSKI[3]

[1]Old Dominion University, 5115 Hampton Blvd., Norfolk, Virginia 23529, USA
[2]The University of Memphis, 3720 Alumni Ave., Memphis, Tennessee 38152, USA
[3]Lawrence Livermore National Laboratory, Livermore, California 94550, USA

Received 15 February 2022; posted 15 February 2022; published 24 February 2022

This special feature issue covers the intersection of topical areas in artificial intelligence (AI)/machine learning (ML) and optics. The papers broadly span the current state-of-the-art advances in areas including image recognition, signal and image processing, machine inspection/vision and automotive as well as areas of traditional optical sensing, interferometry and imaging.

https://doi.org/10.1364/AO.456405

A continuous quest for excellence in pattern recognition using images and texts and the subsequent advancement in computing as well as the abundance of data being generated and collected, all have propelled artificial intelligence (AI) and machine learning (ML) into the spotlight as a formidable technology that is now used in many interdisciplinary applications. A significant portion of the new application areas involve optics and imaging. The recent advances in AI/ML methods have enabled new utility of existing optical sensing, imaging and processing, allowing for huge proliferation of these technologies.

Our practical life is full of patterns: behavioral patterns, traffic patterns, signal patterns in optical communication, imaging, and diffraction patterns. Some of these patterns are found in images generated by cameras that operate in the visible range, while different types of sensors yield data with patterns in emission spectra or radioactive signatures or reflected radar signals. These sensors could be targeting applications such as stress detection, off-normal event detection, 3-D object detection for unmanned vehicle application and many measurements utilizing various patterns of optical signals.

The papers in this issue can be classified in two broad categories: 1) object detection and classification; and 2) measurement and interference-based systems. Although a very broad range of topics is covered by the papers of this issue, we hope this special issue will serve as springboard in generating newer and practical ideas for the applications of ML to optics and imaging.

We thank all the authors for their fine contributions, the reviewers for their valuable comments and suggestions, and the Applied Optics editors and staff for their support and assistance.