Advancing the next generation of photonic systems using machine learning

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The 2024 Nobel Prize in Physics underscores the growing influence of machine learning in diverse areas of physical science. In the field of photonics, machine learning is proving invaluable for tasks such as optimizing and designing fiber-optical communication systems, optical amplifiers, noise characterization of frequency combs, inverse design of photonic components, and quantum-noise-limited signal detection. In this talk, I will review notable applications of machine learning in photonics and explore future directions in this emerging field. Specifically, I will highlight its role in phase noise characterization of optical frequency combs, end-to-end learning for fiber-optic communication, and realization of programmable ultra-wideband Raman amplifiers. Lastly, I will introduce an exciting new application of machine learning: controlling nonlinear interactions in highly nonlinear waveguides.

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