

Accelerating the innovation cycle of nanophotonic systems design

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We will discuss computational algorithms based on deep neural networks that can accelerate the design and simulation of nanophotonic devices. We will discuss the use of generative networks to perform population-based optimization and elucidate how the neural network architecture can be tailored to effectively perform freeform optimization. We will also discuss how physics-augmented deep networks can be trained with a combination of data and physics constraints to serve as accurate surrogate electromagnetic solvers. A principal challenge involves configuring the algorithms in a manner that enables application to a wide range of problems, and we show how these concepts can generalize to the simulation and optimization of photonic devices involving a range of domain sizes, fitting parameters, and functions. Together, these algorithms can effectively search for the global optimum three to four orders of magnitude faster than with conventional methods.