Title: A role of dimensionality reduction in high dimensional design processes: case study in silicon photonics

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Abstract

Nanophotonics finds ever broadening applications that call for designing new complex components characterized by many parameters. For practical application, those components are typically required to perform well with respect to multiple figures of merit. Traditionally, the design process takes multiple iterations, each consisting of optimizing, analyzing the outcomes and tweaking the optimization problem. This is done until the possibilities and limitations of the design space emerge and top design candidates are picked taking into account several considerations. In other words, much of this often time-consuming process is exploratory in nature. In this talk, I will describe how dimensionality reduction can play an important role in doing such exploration more efficiently and even lead to new insights. Relying on the state-of-the-art optimization methods that maximize a selected primary figure of merit, it identifies meaningful lower-dimensional description of the design subspace that is worth exploring. The benefits of simple linear dimensionality reduction will be presented in the context of parameterized designs of integrated photonic components such as a fiber-chip coupler, taking into account various device performance metrics that include manufacturability concerns.

Bio

Yuri Grinberg is an Associate Research Officer within the Digital Technologies Research Center of the National Research Council of Canada. He obtained his PhD in Computer Science from McGill University at 2014 and was an NSERC postdoctoral fellow in Ottawa Hospital Research Institute before joining NRC. His expertise is applied and theoretical machine learning and reinforcement learning. He has co-authored over 25 peer-reviewed publications. In the past several years he has been co-leading the development of AI techniques for the design of photonic components. Currently, he is leading an AI-assisted Photonics Design master project within the NRC-wide AI for Design Challenge Program.