

Optical Filter Design with Factorization Machines with Quantum Annealing

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Abstract

Optical designs that incorporate multiple materials and various geometries create a vast and complex solution space, presenting significant challenges for optimization. Quantum annealing (QA) may provide solutions to such problems. However, current quantum hardware for QA only deals with quadratic couplings, while many problems like optical design involve high-order coupling. The wave properties of optical systems often result in long-distance coupling, which can lead to interference among these systems. Factorization machines (FMs) were proposed by researchers to train a quadratic form suitable for QA. Here, we use factorization machines with quantum annealing (FMQA) for optical design. We explore how to improve the hyperparameters and encodings of FMQA for optical design. Using FMQA, we achieved designs of optical filters with high figures of merit suitable for general applications.