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Using Machine Learning to Alleviate the Sign Problem in the Hubbard Model

Thursday 30 September 2021 15:00 (50 minutes)

I will discuss how machine learning can be used to alleviate the sign problem in stochastic simulations of low-D systems. The method we use is based off neural network (NN) approximations of Lefschetz thimbles that are determined via holomorphic flow. The target Hamiltonian is the Hubbard model, but our application can be adapted to other systems. I provide results for non-bipartite systems that have intrinsic sign problems regardless of the presence of a chemical potential, and also for bi-partite systems with non-zero chemical potential. I also show how the adaption of a complex-valued NN with appropriate affine layers can greatly simplify the calculation of the determinant of the induced Jacobian, providing scaling that is linear in the volume as opposed to volume^3 for standard det J calculations.

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