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Mitigating the Hubbard Sign Problem. A Novel Application of Machine Learning

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Many fascinating systems suffer from a severe (complex action) sign problem preventing us from simulating them with Markov Chain Monte Carlo. One promising method to alleviate the sign problem is the transformation towards Lefschetz Thimbles. Unfortunately, this suffers from poor scaling originating in numerically integrating of flow equations and evaluation of an induced Jacobian. In this talk we present a new preliminary Neural Network architecture based on complex-valued affine coupling layers. This network performs such a transformation efficiently, ultimately allowing simulation of systems with a severe sign problem. We test this method within the Hubbard Model at finite chemical potential, modelling strongly correlated electrons on a spatial lattice of ions.

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