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Machine learning kernels in complex Langevin for real time evolution

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Real time evolution in QFT poses a severe sign problem, which may be alleviated via a complex Langevin approach.
However, so far simulation results consistently fail to converge with a large real-time extent. A kernel in a complex Langevin equation is known to influence the appearance of the boundary terms, and thus kernel choice can improve the range of real-time extents with correct results. For multi-dimensional models the optimal kernel is searched for using machine learning methods. We test this approach by simulating the simplest possible case, a 0+1-dimensional scalar field theory, to which analytic solutions are known, and apply machine-learning approaches to different kernel ansatzes (constant, linear, polynomial). The ultimate goal of the project is to use a neural net as a kernel.

Author: CARSTENSEN, Enno (University of Graz)

Co-author: SEXTY, Dénes

Presenter: CARSTENSEN, Enno (University of Graz)

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