Universität Bielefeld Fakultät für Physik

Seminar

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Monte Carlo calculations on Lefschetz thimbles and beyond

A possible solution to the notorious sign problem for systems with non-zero chemical potential is to deform the integration domain for the path integral in the complex plane to a Lefschetz thimble. We introduce an easy to implement Monte Carlo algorithm to sample the dominant thimble, based on a contraction map on a thimble. We point out that manifolds other than Lefschetz thimbles could be useful for numerical simulations. We describe a family of such manifolds, built using the holomorphic gradient flow, that interpolate between the original integration domain (where the sign problem is severe) and the union of relevant thimbles (where the sign problem is mild but a multimodal probability distribution complicates the Monte Carlo sampling). We show how this works in a couple of models.

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