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# Deforming Path Integration Contours: Application to Finite Density Thirring Model

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Systems of fermions at finite density have complex Boltzmann weights which cause the integrand of the path integral to be highly oscillatory. As a result of these oscillations, standard integration methods require exponential precision in the spacetime volume to compute observables. However, deforming the path integration contour to a manifold which approximates a set of Lefschetz Thimbles tames phase oscillations while leaving physical observables invariant. I will describe this deformation procedure, which is achieved with the holomorphic gradient flow, then apply it to the Finite Density Thirring Model, which is a system with a sufficiently bad sign problem that standard methods fail.

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