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Functional Flows for Complex Actions

Tuesday, 26 July 2022 14:30 (25 minutes)

In my talk I will present a general functional renormalisation group framework for the computation of complex actions. Resolving the complex structure of quantum theories, such as QCD or condensed matter systems such as graphene or spin-imbalanced fermionic gases, may shed light on their phase structure. Restrictions on the phase structure come from exploring complex external fields such as a complex magnetic field in spin systems, or, more generally, complex couplings. The latter gives rise to Lee-Yang zeros in the complex (magnetisation) plane. For the explicit computations we consider both flows of the Wilsonian effective action and the 1PI effective action. In the present formulations the flow of the Wilsonian effective action has a general range of applicability and we obtain results for a ϕ^4 theory in d=0,1,2,3,4 dimensions. These results are also compared with that for the 1PI effective action within its range of applicability. Computations are performed using the Discontinious Galerkin Methods. These advanced numerical methods enable us to solve these highly dynamic equations to very high proximity of the ensuing Lee-Yang singularities, and are reminiscent of reaction-diffusion equations (with an RG-kernel).

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