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Multilevel Picard approximations for high-dimensional semilinear parabolic PDEs and further applications

Abstract: We present the multilevel Picard approximation method for high-dimensional semilinear parabolic PDEs. A key idea of our method is to combine multilevel approximations with Picard fixed-point approximations. We prove in the case of semilinear heat equations with Lipschitz continuous nonlinearities that the computational effort of the proposed method grows polynomially both in the dimension and in the reciprocal of the required accuracy. Moreover, we present further applications of the multilevel Picard approximation method and illustrate its efficiency by means of numerical simulations. The talk is based on joint works with Weinan E, Martin Hutzenthaler, Arnulf Jentzen, Tuan Nguyen and Philippe Von Wurstemberger.