A study of thermal SU(3) supersymmetric Yang-Mills theory and near-conformal theories from the gradient flow

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In recent years, gradient flows of Yang-Mills and spinor fields have opened new possibilities in lattice simulations. I will focus on two applications of this method. Firstly, it has been shown that flowed composite local operators, like condensates and currents, are renormalised independently of the regularisation scheme. This facilitates the study of thermal phase transitions, e.g. in supersymmetric theories. In previous studies we had found that the restoration of the non-anomalous chiral symmetry and the breaking of the centre symmetry occur simultaneously in SU(2) supersymmetric Yang-Mills theory. I will show new results for the gauge group SU(3). The gradient flow is also tightly related to renormalisation group transformations. This can be exploited to directly compute the spectrum of operator dimensions in quantum field theories with an IR conformal point. In this regard I will discuss the computation of the mass anomalous dimension in near-conformal adjoint QCD with $N_f = 2$ and $\frac{3}{2}$.

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