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Bootstrap for matrix models and lattice Yang-Mills theory

Monday 11 September 2023 14:45 (45 minutes)

I will speak about my work with Zechuan Zheng on the numerical bootstrap method for large N matrix models and lattice Yang-Mills theory. First I will demonstrate the method on analytically solvable one matrix model and an "unsolvable" two-matrix model, where this approach appears to be superior in efficiency over Monte Carlo. Then I explain how to study by this method the SU(Nc) lattice Yang-Mills theory in the 't Hooft limit Nc $\longrightarrow$ infinity, at dimensions D=2,3,4. It combines the Makeenko-Migdal loop equations, with the cut-off L on maximal length of Wilson loops, and the positivity conditions on certain correlation matrices. We thus obtain rigorous upper and lower bounds on the plaquette average at various couplings. The results are quickly improving with the increase of the cutoff L. In particular, for D=4 and L=16, the upper bound data in the most interesting weak-coupling phase are not far from the Monte-Carlo results and they reproduce well the 3-loop perturbation theory. We also attempt to extract the information about the gluon condensate from this data. Our results suggest that bootstrap can compliment the Monte Carlo approach, and for some quantities it can provide a tangible alternative to it.

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