V. Kazakov

”Bootstrapping the Lattice Yang-Mills Theory”

ABSTRACT: I will speak about my recent work with Zechuan Zheng where we study the $SU(N_c)$ lattice Yang-Mills theory in the ’t Hooft limit $N \to infinity$, at dimensions D=2,3,4, via the numerical boot strap method. It combines the Makeenko-Migdal loop equations, with the cut-off L on maximal length of loops, and the positivity conditions on certain correlation matrices. Our algorithm is inspired by the pioneering paper of P.Anderson and M.Kruczenski but it is significantly more efficient, as it takes into account the symmetries of the lattice theory and uses the relaxation procedure in the line with our previous work on matrix bootstrap. We thus obtain the rigorous upper and lower bounds on plaquette average at various couplings and dimensions. The results are quickly improving with the increase of cutoff L. For D=4 and L=16, the lower bound data appear to be close to the Monte Carlo data in the strong coupling phase and the upper bound data in the weak coupling phase reproduce well the 3-loop perturbation theory. We attempt to extract the information about the gluon condensate from this data. Our results suggest that this bootstrap approach can provide a tangible alternative to, so far uncontested, Monte Carlo approach.