Contribution ID: **16** Type: **not specified**

Aspects of Numerical Bootstrap*

Thursday, 2 June 2022 14:00 (1 hour)

My talk consists of two parts. In the first part, I will discuss a conformal bootstrap study of three dimensional Quantum Electrodynamics coupled to four flavors of electrons. The model is a classic example of a strongly coupled gauged quantum field theory and is believed to have a conformal low-energy phase, while its critical parameters lacks a conclusive answer. We find that the scaling dimensions of the lowest-charge monopole operator and the adjoint fermion bilinear operator can be bounded in a closed region after implementing spectrum assumptions inspired by the large-N_f perturbative predictions. Bootstrap constraints on the conserved current central charges are comfortably consistent with large-N_f perturbation theory, suggesting that at least part of the large-N_f perturbative predictions form a consistent solution to crossing. I will discuss the validity of the assumptions we used and compare with lattice simulations and previous bootstrap study results. In the second part, I will introduce a new method utilizing a crossing equation in Quantum Mechanics to bound spectrum and matrix elements of any theory with a specific Hamiltonian. The new method is inspired by the method of bootstrapping matrix model using the matrix positivity. I will show that this method provides precision solution to a toy example —Anharmonic Oscillator, and suggest a generalization to study infinite-volume spin chains.

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