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A nonperturbative S-matrix from truncation*

Tuesday, 31 May 2022 10:00 (1 hour)

Recent advances in Hamiltonian truncation have demonstrated it to be a useful tool for obtaining nonperturbative information about quantum field theories, even in the strongly-coupled regime. One particularly exciting feature of this technique is that it can be formulated in Minkowski rather than Euclidean space, making it easier to calculate real-time quantities. Truncation is particularly suited to obtaining spectral information (particle masses, operator spectral densities, etc.), but these are not the only observables of interest, especially when trying to make contact with high-energy experiments. I will explain how to use approximate knowledge of a QFT's energy eigenstates to compute amplitudes for particle scattering, which can in turn be used to compute cross sections and decay rates. I will demonstrate this technique with an example of lightcone conformal truncation for the O(N) model in 2+1d at strong coupling, but it is worth emphasizing that the method can work with any numerical technique that outputs information about approximate Hamiltonian eigenstates. Along with the amplitude in the physical region, I will show that it is possible to analytically continue to the entire complex Mandelstam plane, and in fact that numerical convergence can be even better away from the physical region.

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