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A new method for solving non-perturbative QFTs on the lattice HADI PAPEI, VITALY VANCHURIN, YI-ZEN CHU, University of Minnesota Duluth — We write a code to solve 1-dimensional Euclidean field theories non-perturbatively. This code uses a novel method to generate a random field for any given Lagrangian with a spatially invariant potential and by generating many realizations, it can compute n-point correlators nonperturbatively. We prove that these discretized fields have Markovian property so to generate the field at a point you just need the value of the field of the former point. We use this property by starting from one of the boundaries and generating the field point by point. Because the field is Markovian it will approach to the ground state of the Hamiltonian, so the boundary conditions obeyed by the fields do not affect the calculated n-point correlators, as long as you throw away the field values close to the boundaries. Once this is done, the result amounts to computing the expectation value of products of fields, with respect to the ground state. We test the code for some theories with an exact solution like the massive scalar field. We also calculate the 2-point correlation of the ϕ^4 theory and the result was consistent with perturbative solutions. Our final goal is to use this statistical tools to find a theory that describe the large scale structure of the universe in nonlinear scales.

Hadi Papei
University of Minnesota Duluth

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