Contribution ID: **260**   Type: **Contributed e-poster**

A Variational Approach to Quantum Field Theory

In quantum chromodynamics (QCD), perturbation theory cannot always be employed in order to compute observables, due to the energy-dependent nature of the strong coupling constant, particularly in the low-energy regime where quarks and gluons are confined. Thus, non-perturbative techniques are required. We employ the variational method, a rigorous, non-perturbative approach which provides variational upper bounds on the energy eigenstates. An essential step in the variational method is the choice of trial wave function. In this work, we study the viability of employing a neural network as our variational ansatz. As a first step towards QCD, we study scalar field theories with cubic and quartic couplings, which serve as a toy model for Yang-Mills theories.

session

B. Hadron Spectroscopy

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Session Classification: Poster session