# Nuclei with up to A=6 nucleons with artificial neural network wave functions

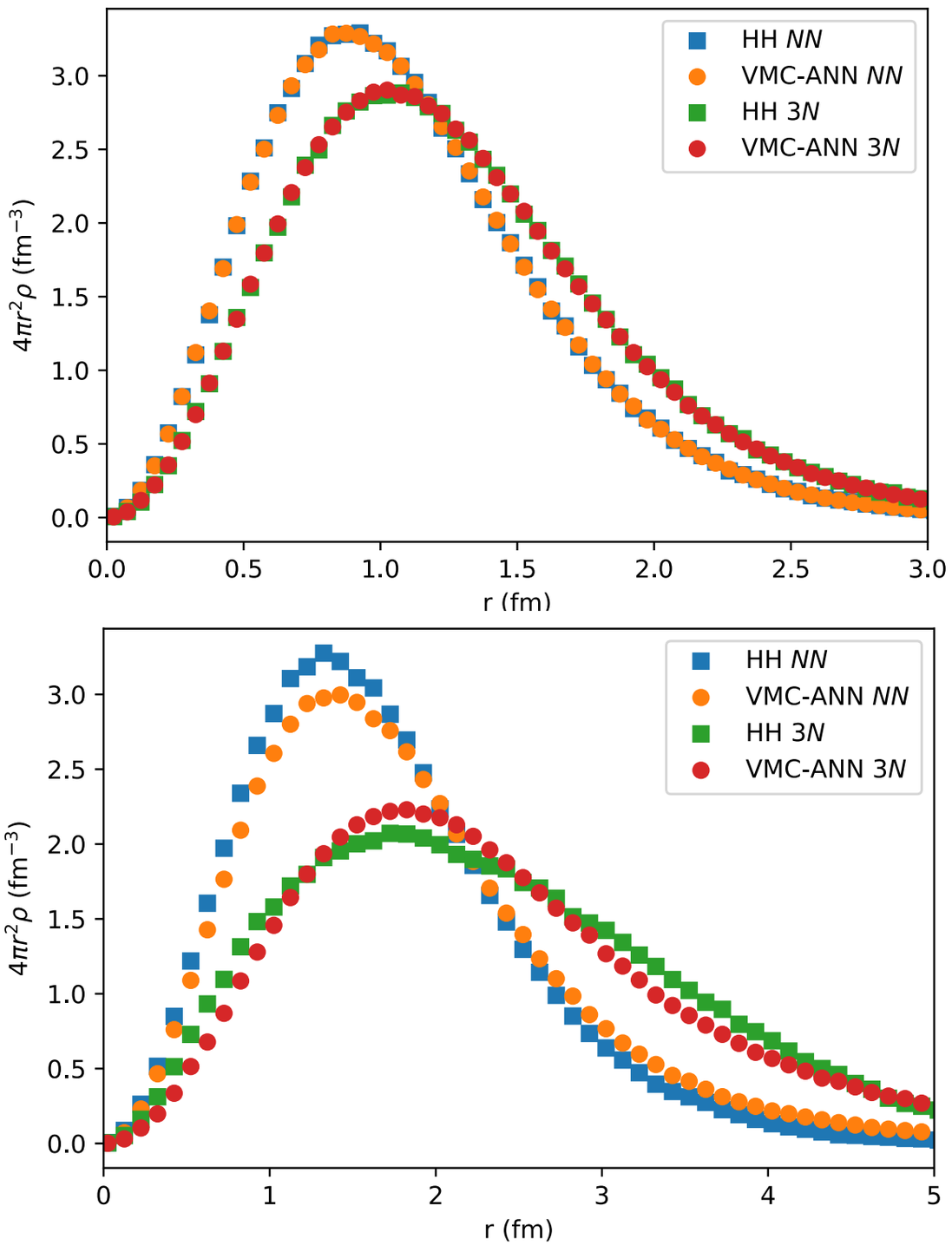


Figure: point-nucleon density of $^4$He (upper panel) and $^6$Li (lower panel) from the VMC-ANN and HH calculations. Results are shown for the two-body force alone (NN) and for the full Hamiltonian that also includes a three-body (3N) potential .

## Objectives

- Extend our variational Monte Carlo algorithm with artificial neural network wave functions (VMC-ANN) to open-shell $^6$He and $^6$Li nuclei;
- Test the representative power of the ANN wave function comparing the binding energies, point-nucleon densities, and radii of A≤6 nuclei with the highly accurate hyper-spherical harmonics (HH) method;

## Impact

- Improved our previous ANN correlation operator by taking as input pair-wise coordinates;
- The mean-field component of the wave function is expressed in terms of ANN single-particle orbitals;
- Using a more realistic LO pionless-EFT Hamiltonian than in our previous work, we successfully tested the VMC-ANN algorithm against virtually-exact hyper-spherical harmonics calculation;
- Opened the way to larger nuclei and nucleonic matter;

## Accomplishments

- A. Gnech, C. Adams, N. Brawand, G. Carleo, A. Lovato, N. Rocco, arXiv:2108.06836 [nucl-th], (Few-Body Systems in press)