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Machine learning in the problem of extrapolation of no-core shell model results

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We modify the method of extrapolating the variational calculation results to the case of the infinite model space using machine learning of neural networks suggested in Ref. [1]. The main idea of the modified method is to train an ensemble of artificial neural networks using a preliminary selection of training data, a subsequent selection of the trained neural networks according to some criteria, and a statistical processing of the selected network predictions. We propose a new neural network topology with an appropriate set of learning parameters.
The suggested modified method provides stable results, does not require a division of data into the training and test sets, ensures the convergence of predictions with increasing the learning data set by including the results from larger model spaces as well as a high statistical confidence of the final results.
We extrapolate results obtained within the no-core shell model [2] with NN interaction Daejeon16 [3] for ground state energies and root-mean-square radii of 6 Li, 6 He and 6 Be nuclei. We obtain the 6 Li ground state with the same accuracy but higher in energy than the predictions of Ref. [1]. However, our approach has a higher statistical confidence.

References

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Section

Nuclear structure: theory and experiment

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