## Conference on Quantum-Many-Body Correlations in memory of Peter Schuck (QMBC 2023)



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## Machine learning light hypernuclei

jeudi 23 mars 2023 12:15 (30 minutes)

We employ a feed-forward artificial neural network to extrapolate at large model spaces the results of ab-initio hypernuclear No-Core Shell Model calculations for the  $\Lambda$  separation energy  $B_{\Lambda}$  of the lightest hypernuclei,  ${}^{3}_{\Lambda}$ H,  ${}^{4}_{\Lambda}$ H and  ${}^{4}_{\Lambda}$ He, obtained in computationally accessible harmonic oscillator basis spaces using chiral nucleon-nucleon, nucleon-nucleon and hyperon-nucleon interactions. The overfitting problem is avoided by enlarging the size of the input dataset and by introducing a Gaussian noise during the training process of the neural network. We find that a network with a single hidden layer of eight neurons is sufficient to extrapolate correctly the value of the  $\Lambda$  separation energy to model spaces of size  $N_{max} = 100$ . The results obtained are in agreement with the experimental data in the case of  ${}^{3}_{\Lambda}$ H and the 0<sup>+</sup> state of  ${}^{4}_{\Lambda}$ He, although they are off of the experiment by about 0.3 MeV for both the 0<sup>+</sup> and 1<sup>+</sup> states of  ${}^{4}_{\Lambda}$ H and the 1<sup>+</sup> state of  ${}^{4}_{\Lambda}$ He. We find that our results are in excellent agreement with those obtained using other extrapolation schemes of the No-Core Shell Model calculations, showing this that an ANN is a reliable method to extrapolate the results of hypernuclear No-Core Shell Model calculations to large model spaces.

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Classification de thématique: Quarks and Hyperons