Nuclear mass predictions based on deep neural network and finite-range droplet model (2012)

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A neural network with two hidden layers is developed for nuclear mass prediction, based on the finite-range droplet model (FRDM12). Different hyperparameters, including the number of hidden units, the choice of activation functions, the initializers, and the learning rates, are adjusted explicitly and systematically.

The resulting mass predictions are achieved by averaging the predictions given by several different sets of hyperparameters with different regularizers and seed numbers.

The overall root-mean-square deviations of nuclear mass have been reduced from 0.603 MeV for the FRDM12 model to 0.200 MeV and 0.232 MeV for the training set and validation set, respectively.

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