Precision study of charge radii for boron isotopes

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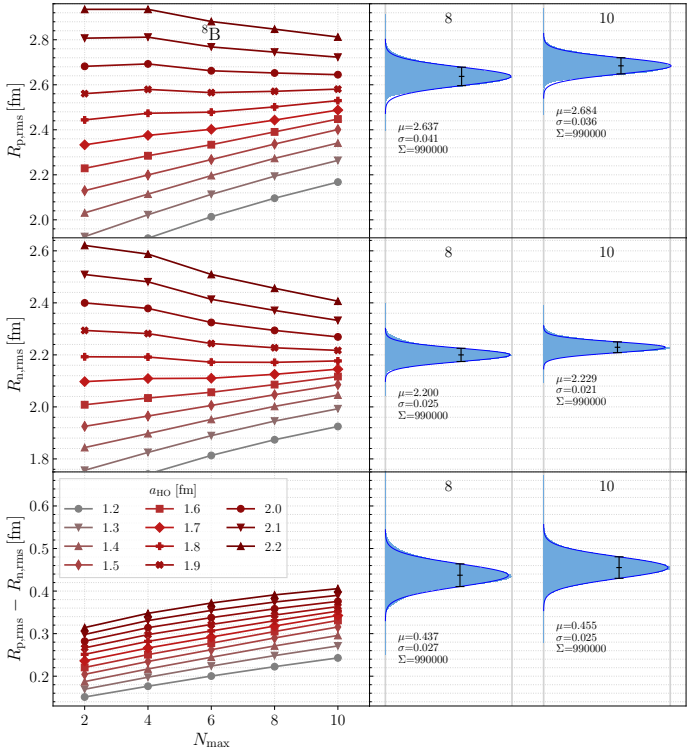

Motivation

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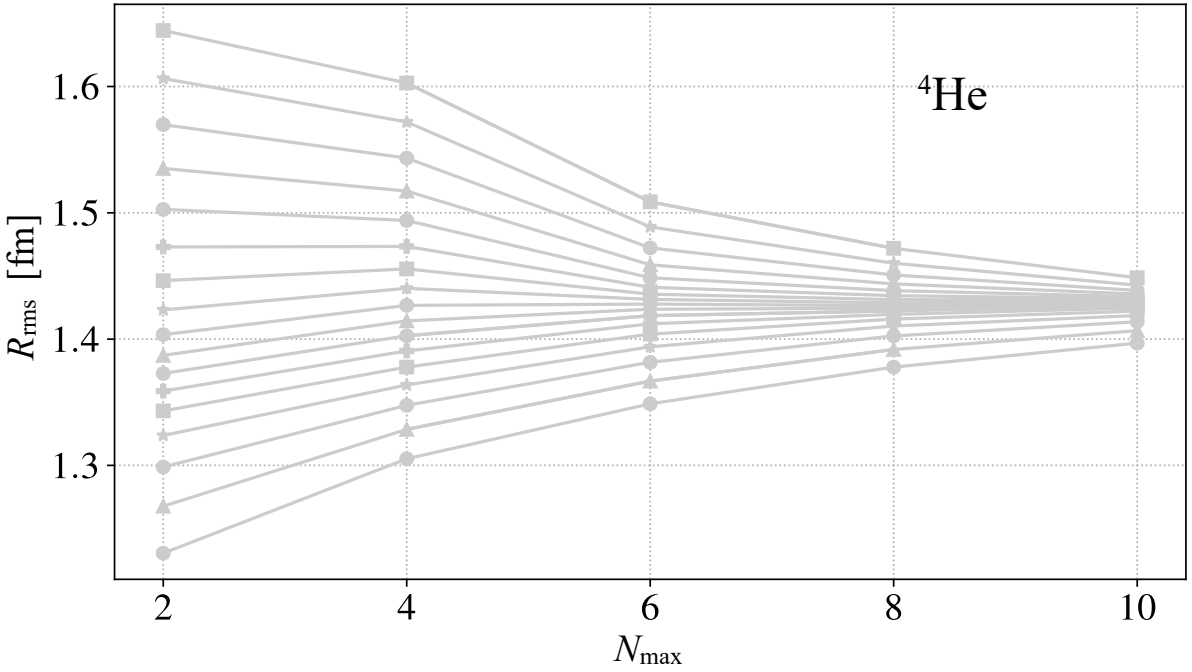
- Radii more difficult to converge in NCSM than energies
- Need post-processing for quantitative predictions
- No established methods for model-space extrapolation
- Interesting application: Boron isotopes with ongoing high precision experiments

NCSM data



- Calculations for different oscillator lengths
- Construct samples

NCSM data

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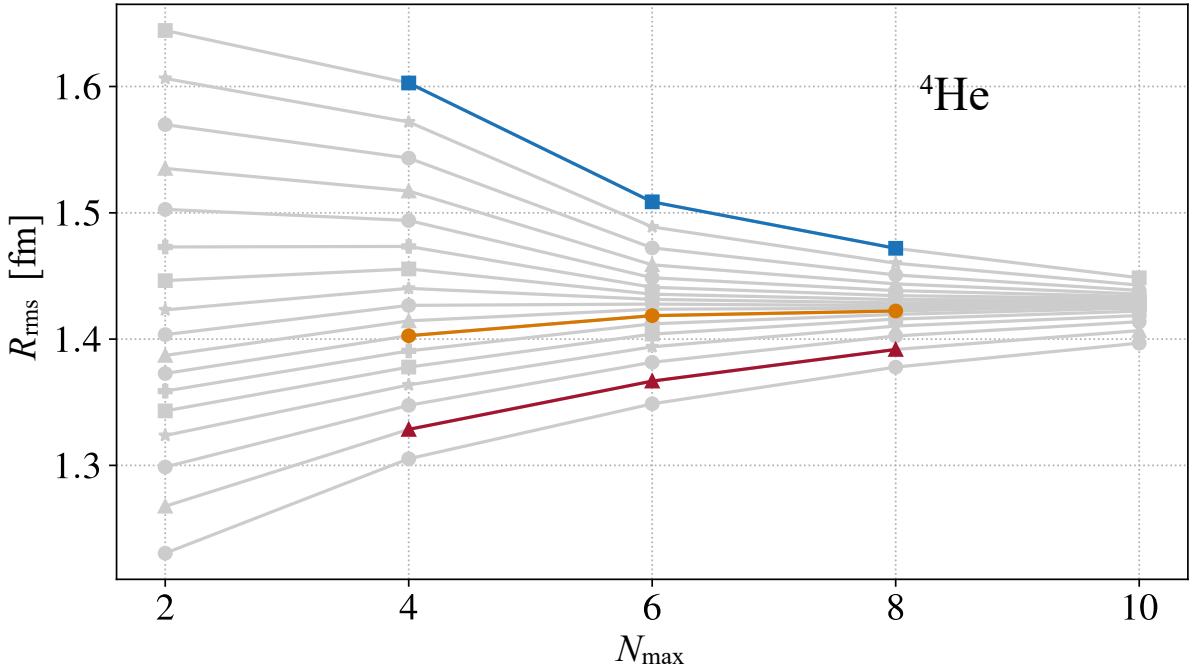

→ Classical extrapolation

→ Artificial neural networks

Statistical analysis

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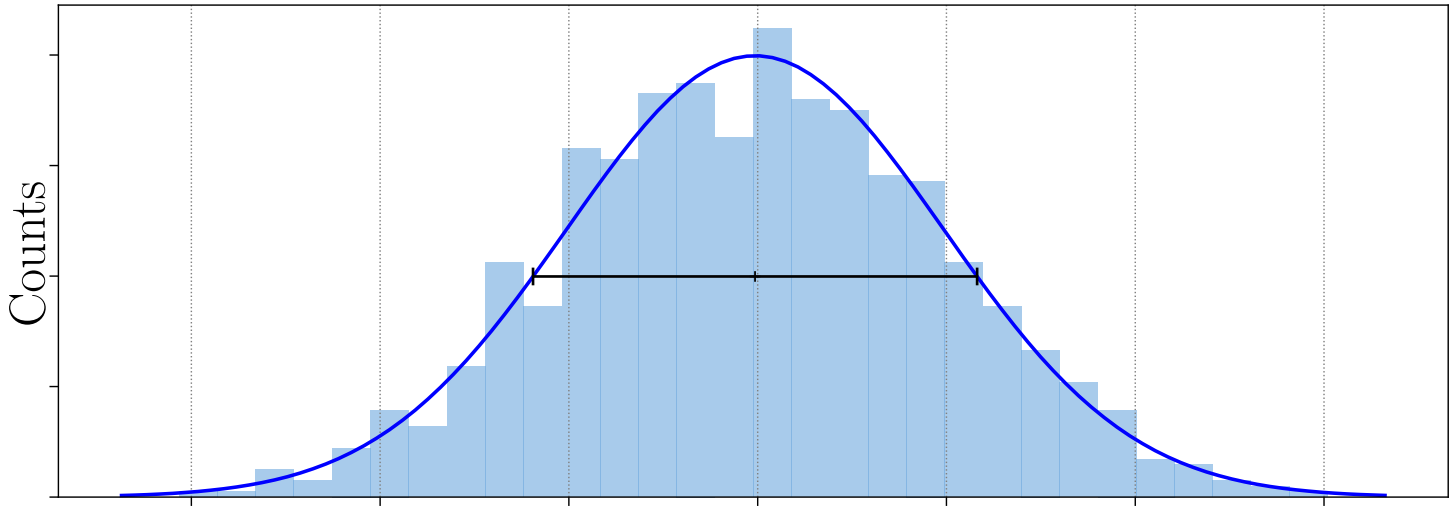
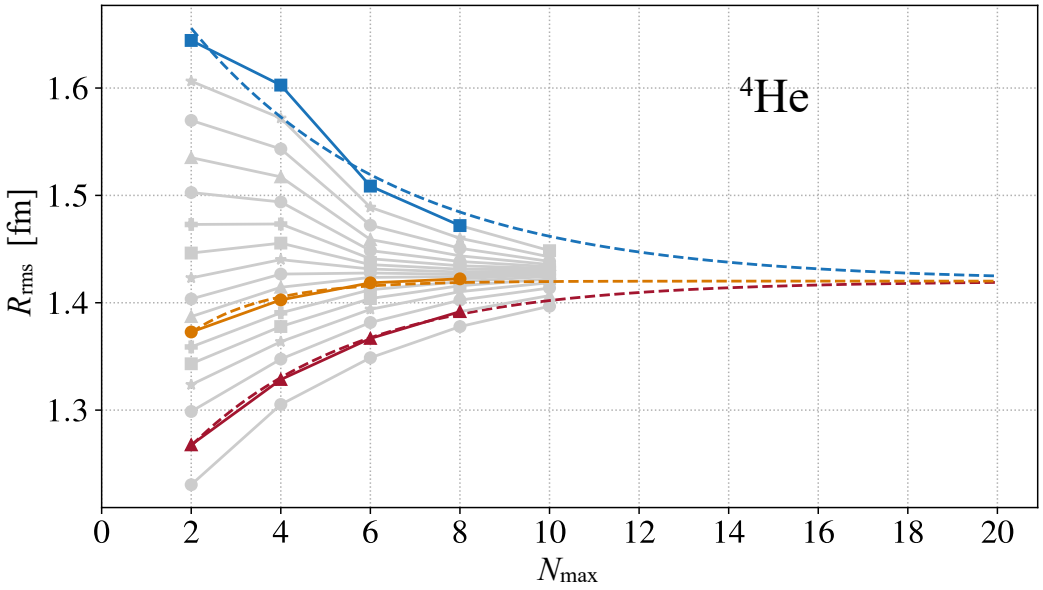


- Extrapolating all samples provide multiple predictions.
- Use mean, standard deviation, or Gaussian fits for predictions with uncertainties.

Classical extrapolation method

- Exponential function fitted to sample
- Simultaneous fit with same O^{∞} for all frequencies



$$O(N_{\mathrm{max}}) = O^{\infty} + a \cdot \exp\{-b \cdot N_{\mathrm{max}}\}$$

Artificial neural networks

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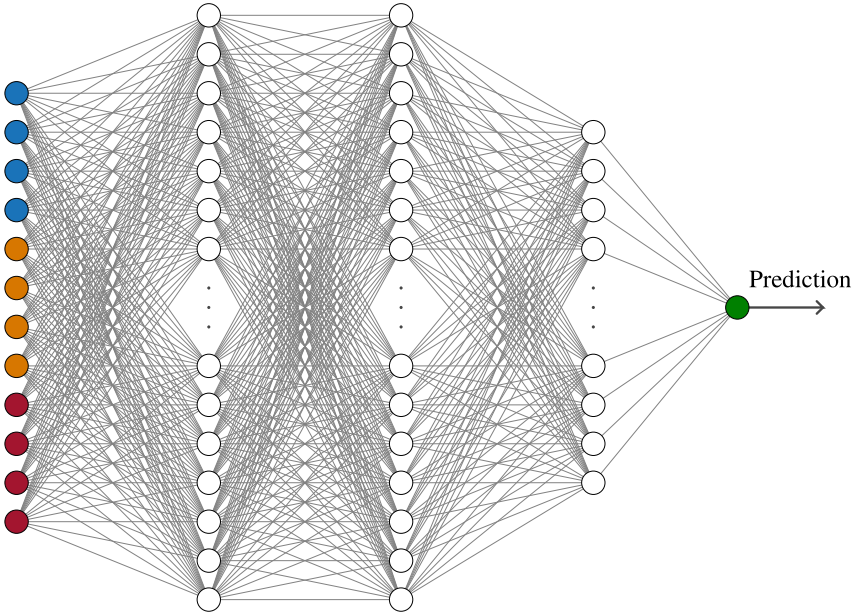
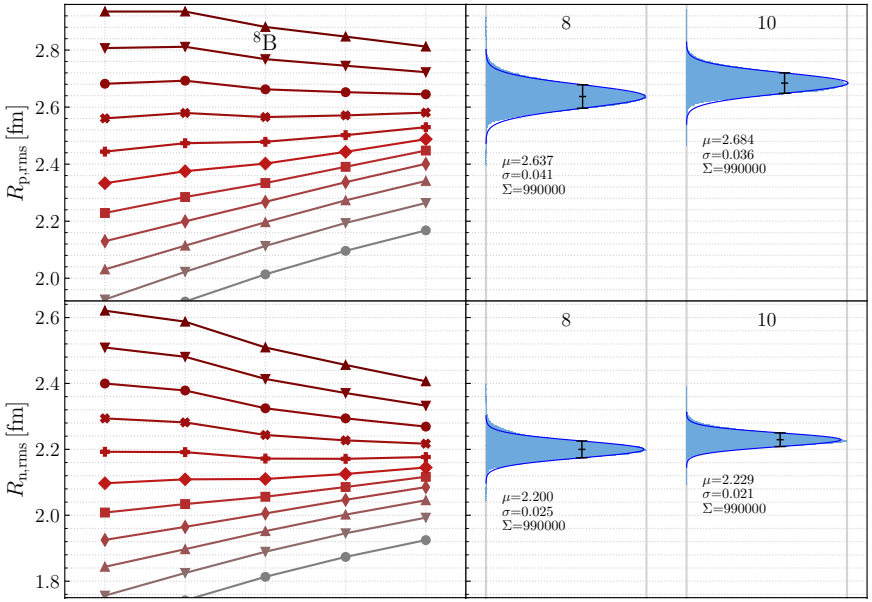
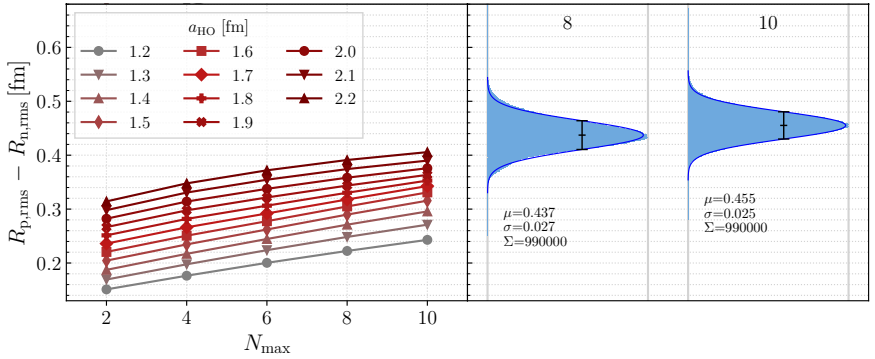
- Dense feed forward network
- Requires training for capture convergence behavior
- Multiple networks for multiple predictions for one sample
- Same input as for classical extrapolation



Wolfgruber, T et al., arXiv:2310.05256, 2023

Example: ^{8}B proton-halo





Thank you for your attention!