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A novel method for extracting and emulating continuum physics of finite quantum systems

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The so-called reduced basis method from the field of model order reduction is being actively adapted in studying nuclear many-body bound states. It provides fast and accurate interpolations (or emulations) of the expensive many-body calculations in the input parameter space. These emulators are efficient interfaces through which users can effortlessly access these calculations.

In this talk, I will discuss my recent studies on generalizing the method to deal with the continuum problems in finite quantum systems (e.g., nuclei or molecules). Two approaches have been developed. The so-called real-energy emulation of the continuum calculations is viable for few-body systems. The other, called complex-energy emulation, works in the energy complex plane. The latter method could be used to extract many-body continuum physics (including scattering, response, and resonances) from bound-state-like calculations. Moreover, it can emulate these extractions in the model input parameter space (e.g., Hamiltonian parameters). I will also briefly mention intriguing connections between the complex-energy emulation and recent progress in studying optimal rational approximation as a numerical analytical continuation method.

Primary author(s) : ZHANG, Xilin (Facility for Rare Isotope Beams, Michigan State University)

Presenter(s) : ZHANG, Xilin (Facility for Rare Isotope Beams, Michigan State University)

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