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Extrapolation and emulation techniques for few-body resonances

Content

Quantum resonances, i.e., metastable states that decay over time, are a fascinating phenomen relevant in different areas of physics. In nuclear physics, they not only appear as excited states of various atomic nuclei, but they can also constitute the ground state of exotic nuclei near the edges of nuclear stability. Characterized by being strongly coupled to the continuum, resonances are notoriously challenging to describe theoretically and to compute numerically, especially when they appear as genuine few-body phenomena.

In this talk, I discuss how the complex-augmented eigenvector continuation (CA-EC) method can be used to track resonance states as the underlying interaction is varied. In particluar, CA-EC is able to robustly extrapolate states all the way from being bound to becoming resonances. Such extrapolations were originally demonstrated to work well for two-body resonances, and recent work establishs that this remains true for few-body systems. In particular, CA-EC can be combined with different techniques used to construct non-Hermitian Hamiltonians and it therefore provides a path towards scalable resonance calculations in nuclear physics.

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